



*Files are in Adobe format.
Download the newest version from Adobe.*

2010 COMBAT VEHICLES CONFERENCE

Dearborn, MI

6 - 9 October 2010

KEYNOTE ADDRESS: *Army Requirements and Vehicle Modernization*

- MG Walter Davis, Deputy Director, Army Capabilities Integration Center (ARCIC)

Combat Vehicle Research and Development – Networks, Mr. Magid Athnasios, Tank Automotive Research, Development & Engineering Center, Executive Director of Engineering

MARINE CORPS PANEL

- ***“Defining an Integrated, Networked Ground Combat Force for the Next Decade”*** BG Frank L. Kelley Commander, Marine Corps Systems Command
- ***Expeditionary Fighting Vehicle (EFV)***, COL Keith Moore
- ***Marine Corps Light Armored Vehicles Program Management Office***, COL Brian Buckles, Program Manager Light Armored Vehicles

PEO & PM GROUND COMBAT SYSTEMS PANEL

- Mr. Scott Davis, PEO, Ground Combat Systems

WAR FIGHTER PANEL

- ***2d Light Armored Reconnaissance Battalion***, CAPT Christopher Conner
- ***“ARROWHEAD” OIF Operations Summary***, CSM Alan Bjerke, USA
- ***TASK FORCE 278 ACR***, LTC John Krenson, USA
- ***Twelve Lessons in Twenty Years***, COL Peter Newell, USA

GREYBEARD PERSPECTIVE

- GEN David McKiernan, USA



Army Requirements and Vehicle Modernization

MG Walter L. Davis
Deputy Director
Army Capabilities Integration Center
(ARCIC)

8 November 2010

US Army Training and Doctrine Command

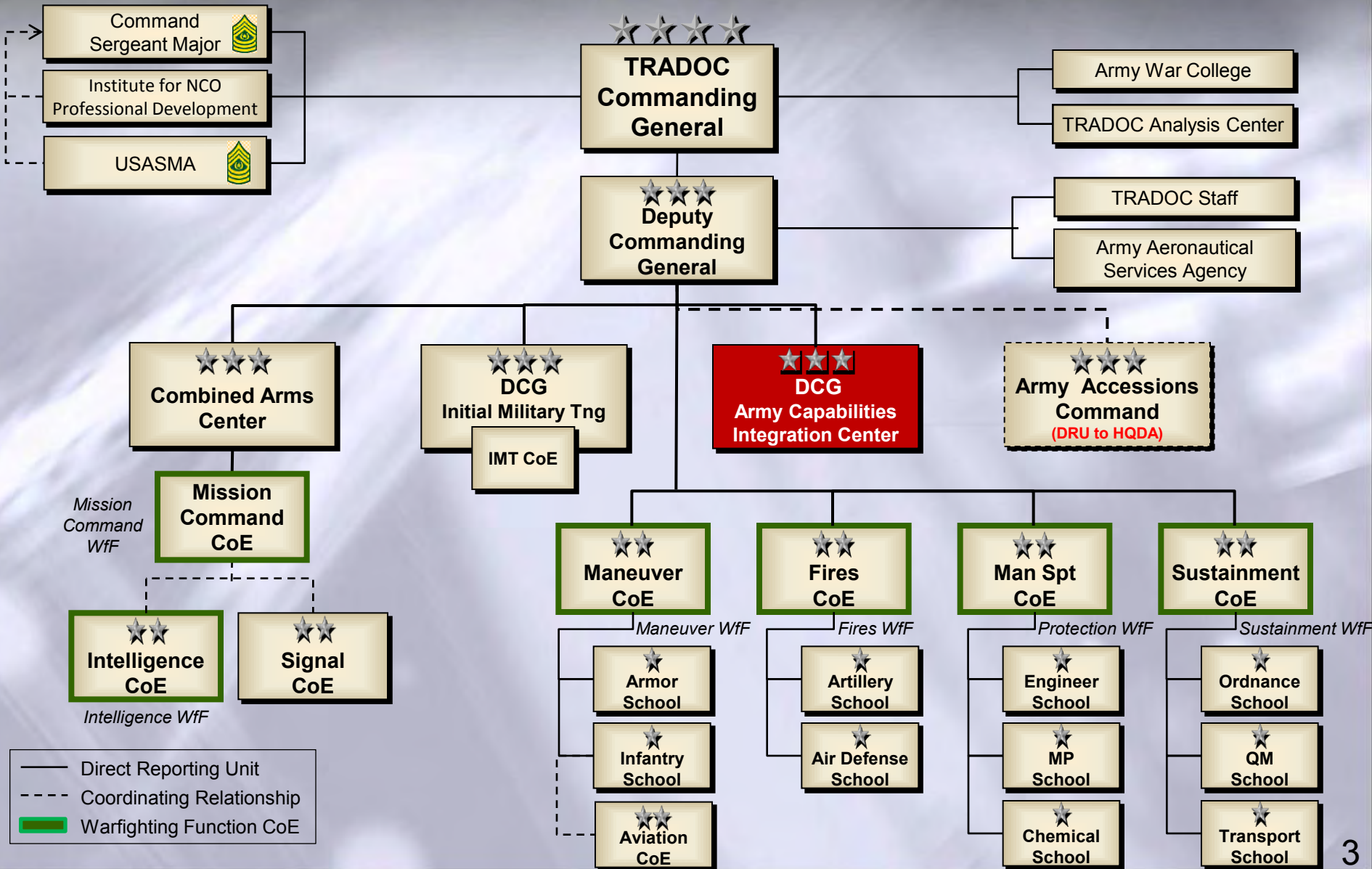
TRADOC: Victory Starts Here !

Agenda

- TRADOC & ARCIC Overview
- The Future Operational Environment
- The New Army CAPSTONE Concept and WHAT we need the Army to do
- Where Combat Vehicle Modernization Fits....
 - ❖ From Concept to Capabilities
 - ❖ Wheeled Vehicle Strategy
 - ❖ Combat Vehicle Strategy

Organization

TRAINING AND DOCTRINE COMMAND



Emerging Trends in the Operational Environment

Uncertainty

Location, Adversaries, Context, Duration



Increased Competition



Rising powers, organized militias, technology as a leveler

Hybrid Threats



Dynamic combinations of conventional, irregular, terrorist and criminal capabilities

Pace of Change



Exponential, not Arithmetic

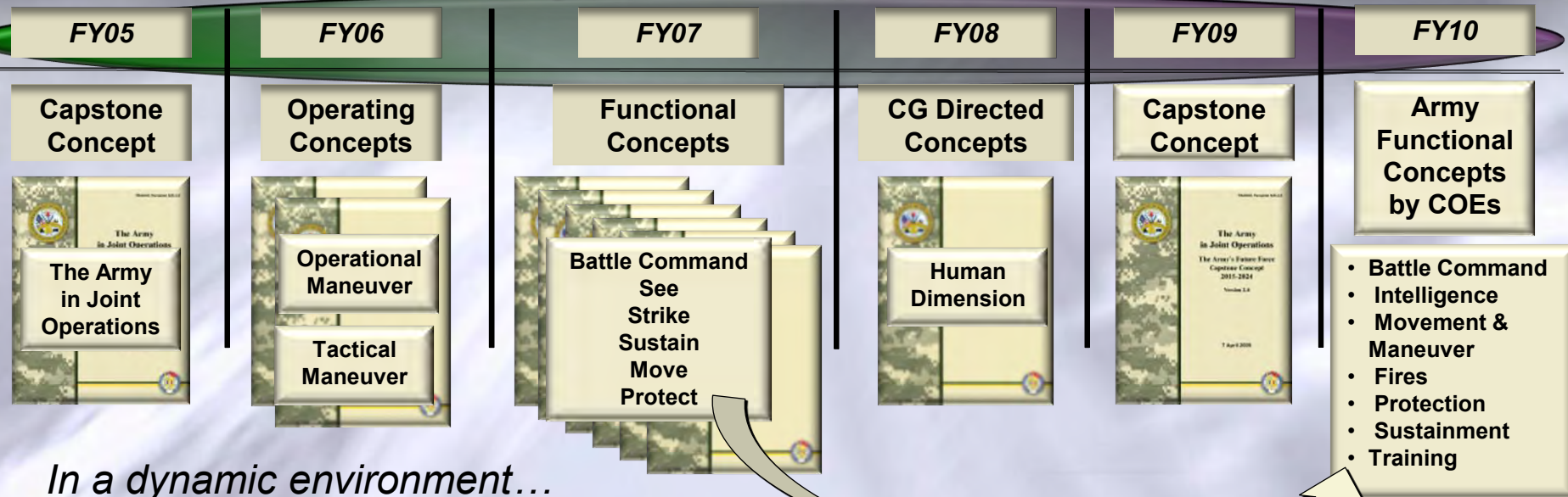
Decentralization

Networked Forces, Dispersed Among the People



Military Power in the 21st Century will be defined by our ability to adapt

The Army Concept Framework



In a dynamic environment...

Concepts:

- Organize ideas about how we fight;
- Identify
 - problems to solve,
 - solution components,
 - and how those components work together;
- Account for DOTMLPF-C implications;
- Nest and support Joint Operations.

Moving to:

Outcomes:

Concepts provide a foundation of warfighting assessments. They provide future focus for developing required capabilities for an integrated and networked force.

2009 Army Capstone Concept

- Operationalize the CSA's vision of balancing the Army
- Clearly articulate how the Army *thinks about* future armed conflict under conditions of *uncertainty* and complexity in an Era of Persistent Conflict
- Describe how the Army conducts operations as part of a Joint, Interagency, Intergovernmental & Multi-national (JIIM) team
- Use *grounded projections* to describe the broad range of capabilities the Army will require in 2016-2028 to apply finite resources
- Place modernization decisions in a broader context of future armed conflict
- Provide a conceptual *foundation* to guide future force development

Ultimately, the ideas that emerge will guide changes across DOTMLPF

Adapting Concepts to Capabilities...

CURRENT

FUTURE

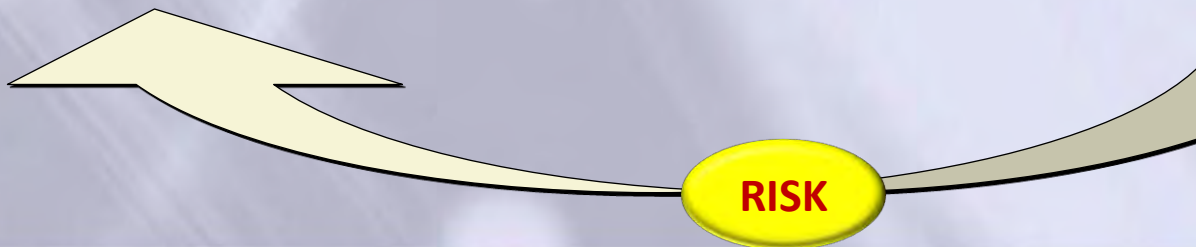


versatile mix ...tailorable ...networked ...rotational cycle... sustained flow of ready forces for full spectrum opns ...hedge against unexpected ...sustain all-volunteer force

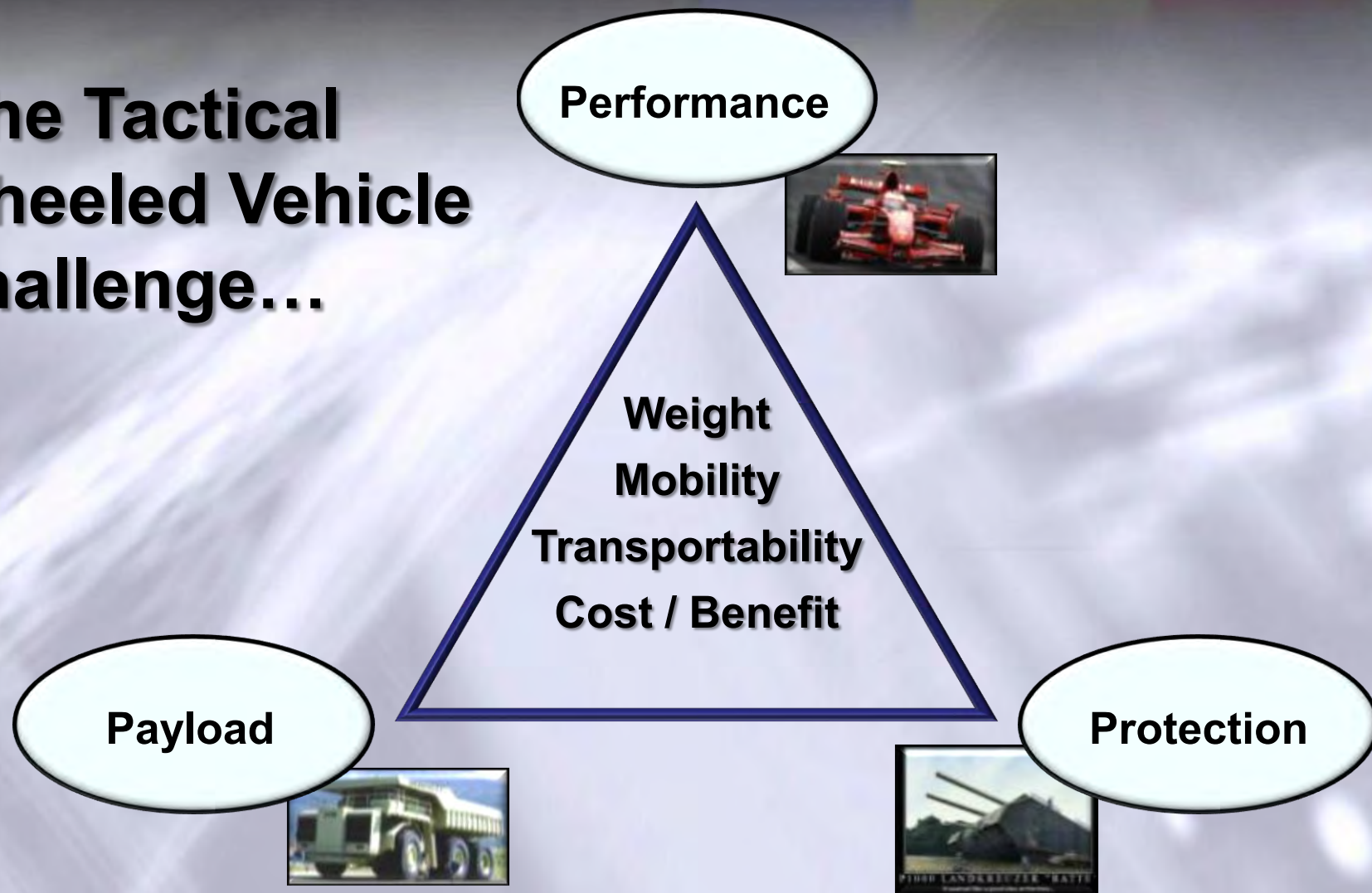


- Experiment
 - War game
 - Analyze
 - Evaluate
 - Integrate
- by/with/thru
Centers of
Excellence*

- Capabilities to
Joint Force Commanders**
- organizations of
 - well-trained soldiers
 - possessing right skill sets
 - with superior equipment
 - employing sound doctrine
 - led by competent and confident leaders who understand their organizations' potential
 - and are empowered in combat by superior information
 - supported by state-of-art facilities

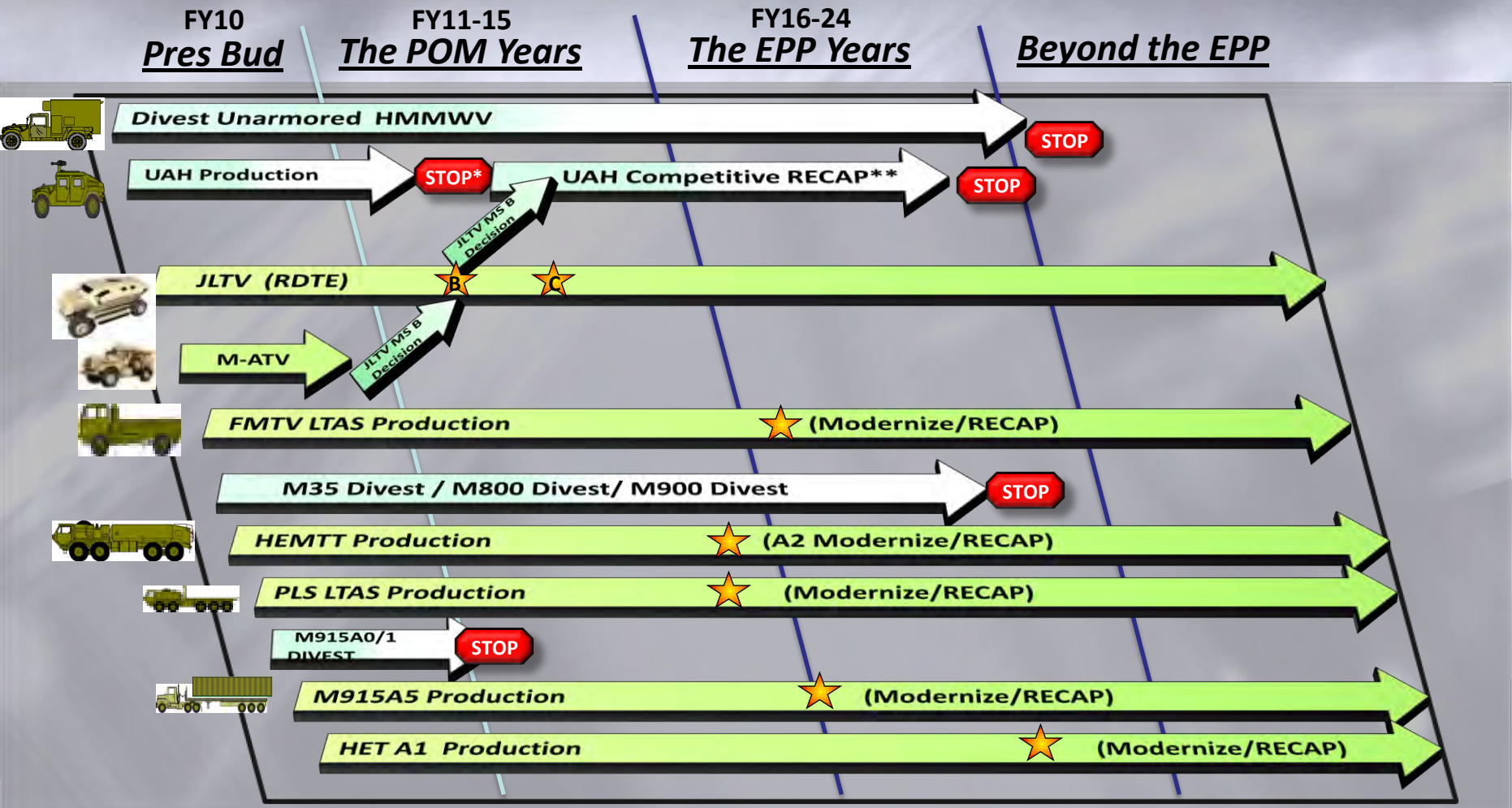


The Tactical Wheeled Vehicle Challenge...



The fully burdened cost of trucks and vehicles

TWV Modernization Strategy...



★ = Milestone Decision

★ = Decision Point

Ground Combat Vehicle...

Versatility

- Configuration and employment options
- Employed across full range of military operations
- Employed in combination with other vehicles
- Potential to adapt as technologies mature

Force Protection

- Blast protection equivalent to MRAP
- Base level protection scalable to threat and mission
- Ability to observe 360 degrees (closed or open hatch)
- Integrate improved protection measures when they mature
- Fire protection equal to or better than current platforms

Lethality

- Lethal self-protection to defeat like systems
- Hosts non-lethal systems

Mobility

- Negotiates complex urban terrain
- Cross country mobility
- First GCV increment mobility equal to Bradley

Sustainability

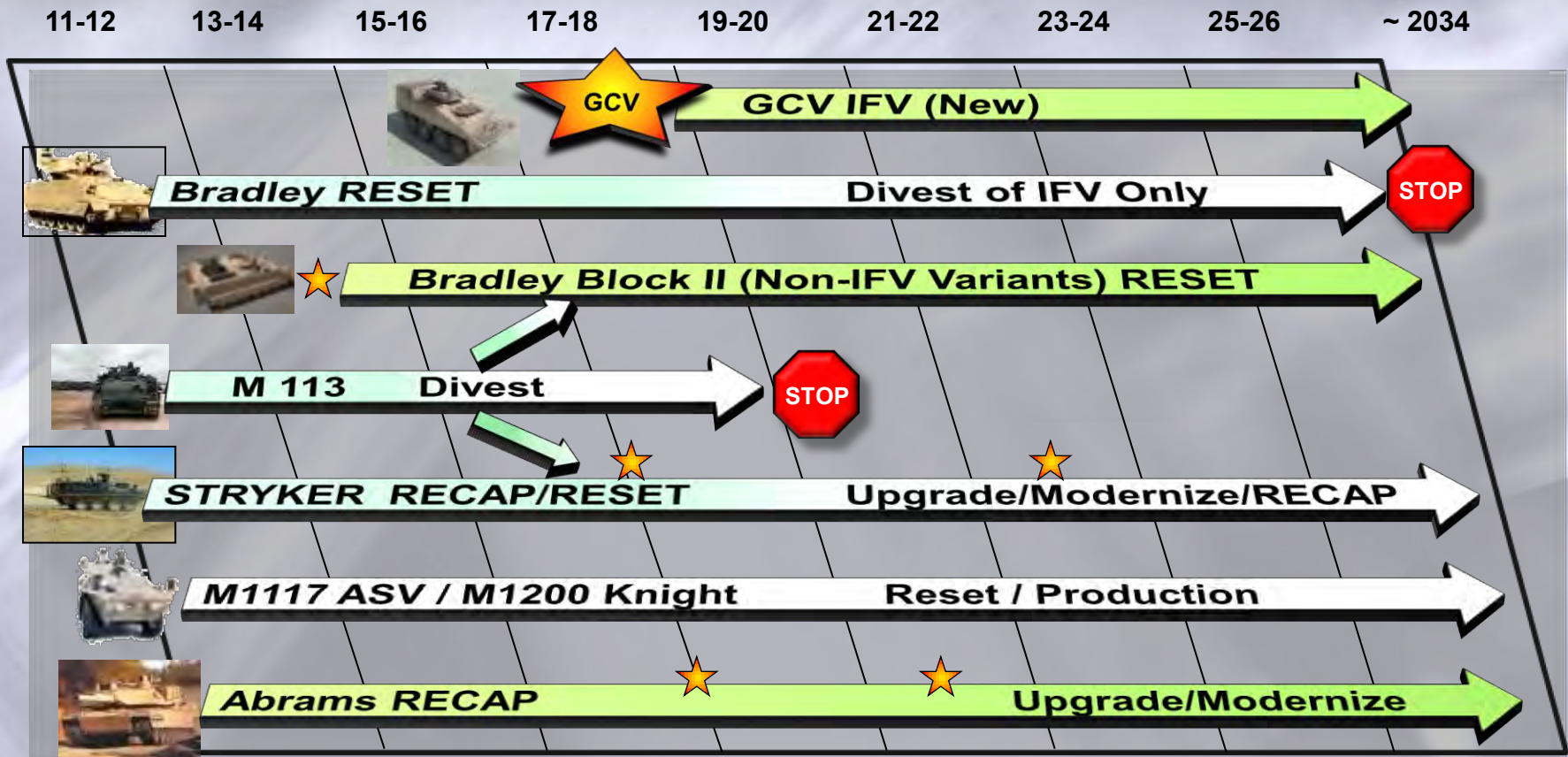
- Reduces the BCT sustainment burden
- Initial increment availability rate equal to Stryker
- Consumes 10% less fuel than current vehicles
- Exportable electrical power and battery charging

Network Integration & Interoperability

- Hosts the Army's battle command network systems
- Growth potential in electrical and computing power
- Retains functionality with degraded networks
- Facilitates Soldier integration
- Enable employment of robotic systems



Developing a Combat Vehicle Strategy...



★ = Increment Point

“...robotics offer the potential to deploy appropriate combinations of manned and unmanned systems to perform an increasing range of tasks”

(Army Capstone Concept)

Guiding Principles ...

- **Robotics enable the humans**
- **Humans should not have to accommodate**
- **Early user and technology developer collaboration**
- **Use “system of system” to measure effectiveness**
- **Get more from force structure ; Cost / Benefit**

Operational Adaptability through Affordable Force Modernization

- ✓ **Establish baselines**
- ✓ **Innovate – when opportunities meet needs**
 - ✓ **Learn, adapt, learn, adapt...**
- ✓ **Converge experimentation, exercises, and testing**
 - ✓ **Soldiers earlier**
 - ✓ **Establish constraints**
 - ✓ **Cost / Benefit**
 - ✓ **Risk**
 - ✓ **Motivate to Warfighter Outcome**
 - ✓ **Speed matters**

Buy fewer, more often



Army Requirements and Vehicle Modernization

MG Walter L. Davis
Deputy Director
Army Capabilities Integration Center
(ARCIC)

8 November 2010

US Army Training and Doctrine Command

TRADOC: Victory Starts Here !



Combat Vehicle R&D- Networks

Tank Automotive Research,
Development & Engineering Center

Mr. Magid Athnasios, Executive Director of Engineering



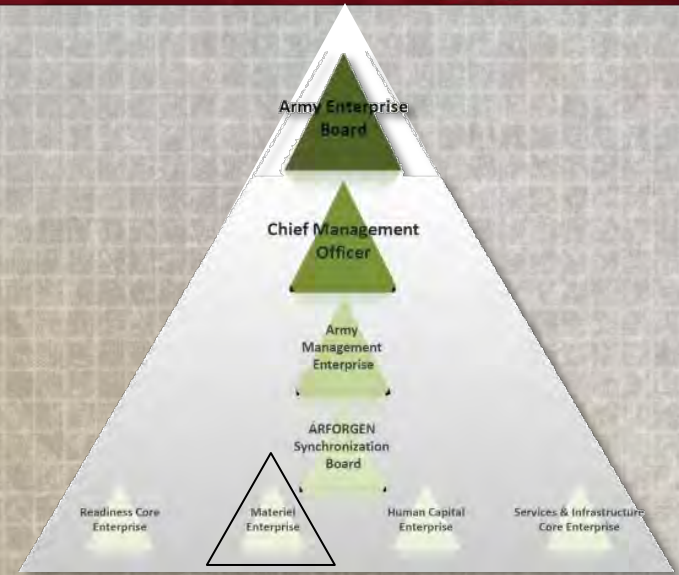


TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

unclassified

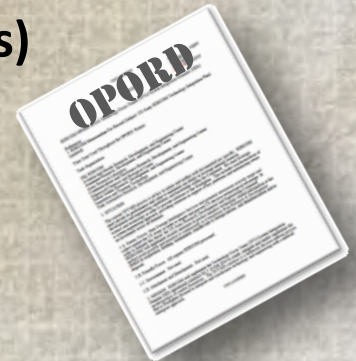
RDECOM Integration Construct

- **Vertical:** System Integration Domains
- **Horizontal:** Technology Focus Teams

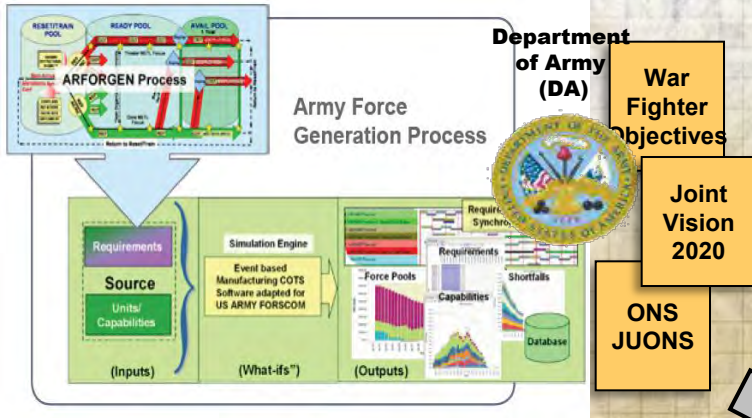


Approach

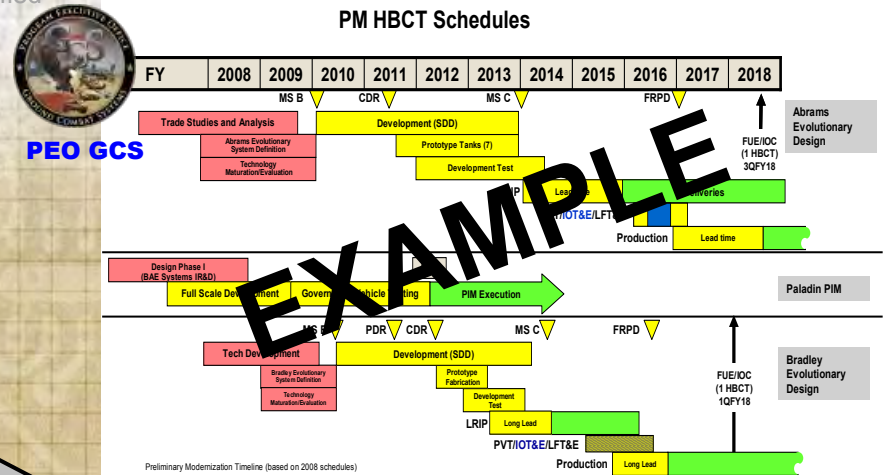
- Task Organized
- Total Asset Visibility (5Ps)
 - People
 - Places
 - Purse
 - Processes
 - Products



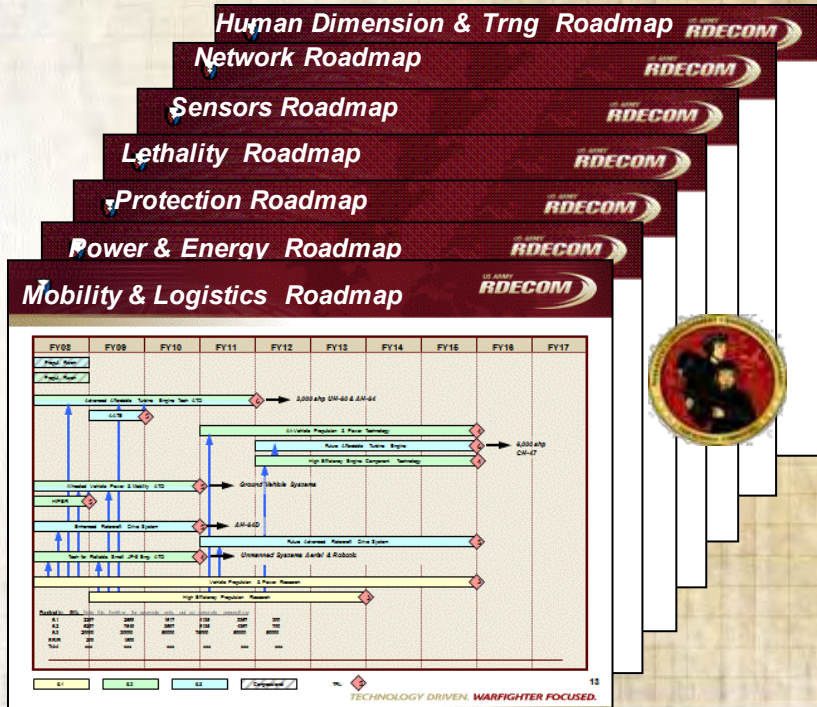
unclassified



unclassified



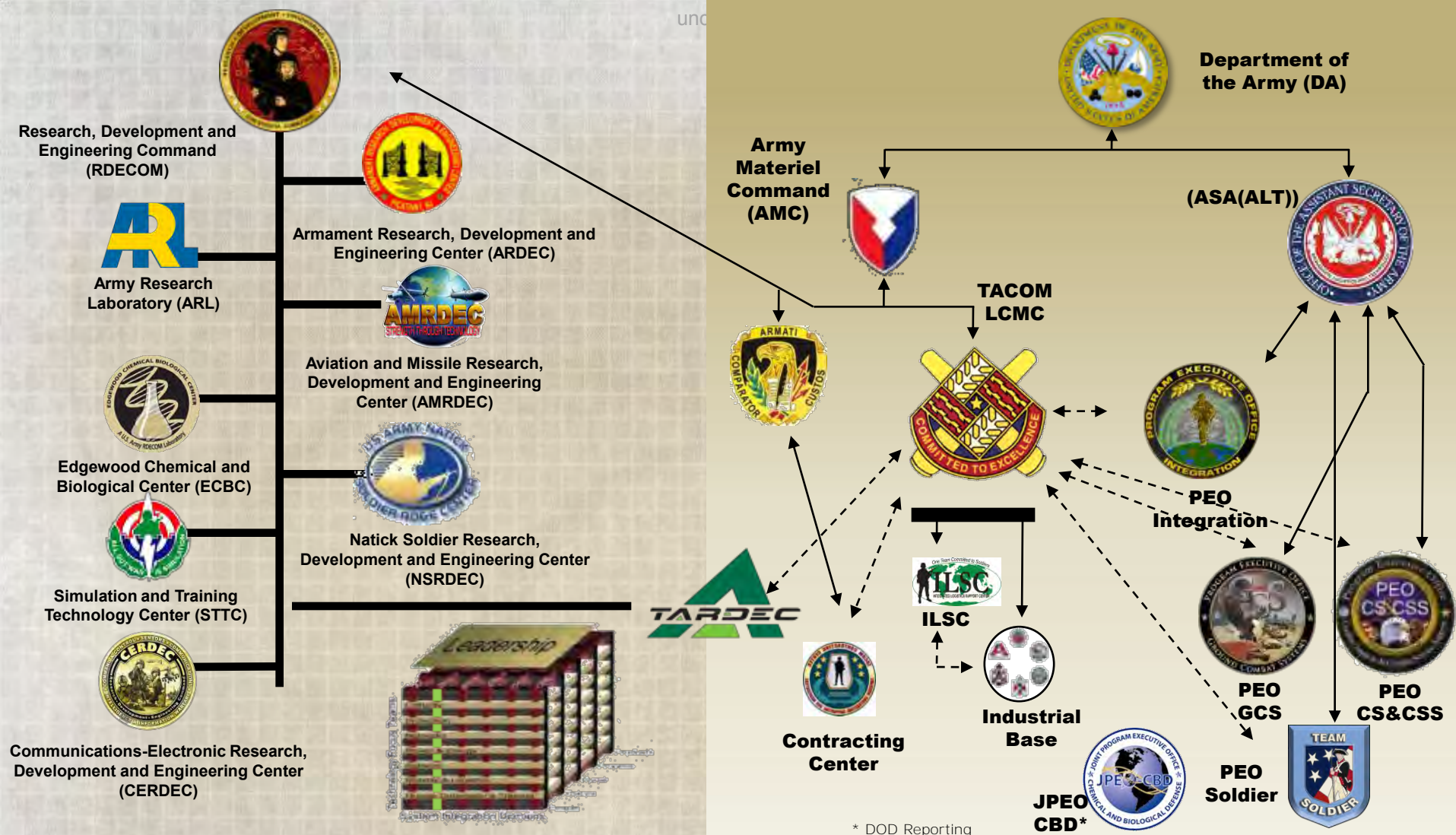
EXAMPLE



Ground Systems Integration Domain
Synchronized Views

- Capability Based
- Time Opportunity Based
- Resource Based


unclassified



Reach back to over 8,500 Scientists and Engineers

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Ground Vehicle Areas of Technical Expertise



Ground Systems
Power & Mobility Integration

Vehicle Electronics &
Architecture Integration

Ground Systems
Survivability Integration

Maturation of Ground Robotics
& Vehicle Situational Awareness

Development of Force
Projection Technology

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Sustainment, Standardization, Transportability & Recovery

- Sustainment Requirements Development (OMA, AWCF, SSTS)
- Standardization
- Towing and Recovery
- Qualified Products List (QPL)
- Secondary Item Engineering
- System Improvement and Integration
- * Transportability
- Parts Commonality

Industrial Base, Manufacturing, Logistics & Value Engineering

- Industrial Base Engineering
- Manufacturing Engineering / MRA
- Cost Reduction (VE, OSCR, TOCR)
- DLA Support
- Logistics Engineering
- Engineering Project Management

Security Assistance, Materials, Environmental & Corrosion

- Environmental Management
- Corrosion Prevention and Control
- Materials Engineering
- Welding, Fastening and Adhesives
- Security Assistance Support
- * Weight Management

Software Engineering Center

- Software Development
- Software Acquisition & Management
- Tactical Systems Information Assurance
- Software Engineering & Support

Product Life Cycle Data Management

- Configuration Management
- CAD / Model Based Engineering
- Secondary Item Data Management

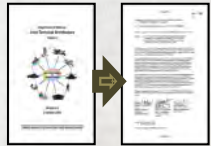
RAM, Test, Quality & Tire Engineering

- Quality Assurance
- RAM
- Test
- Tire Engineering

Systems Engineering Group

- * System Architecture Design
- Risk Management
- SE Planning
- Technical Assessments & Reviews
- SE Requirements Engineering

Full System Lifecycle Support



Systems Engineering Processes

Requirements

Architectures & Standards

Software Development

System Integration

Testing

Field Support

Sustainment

Supporting the Current Force

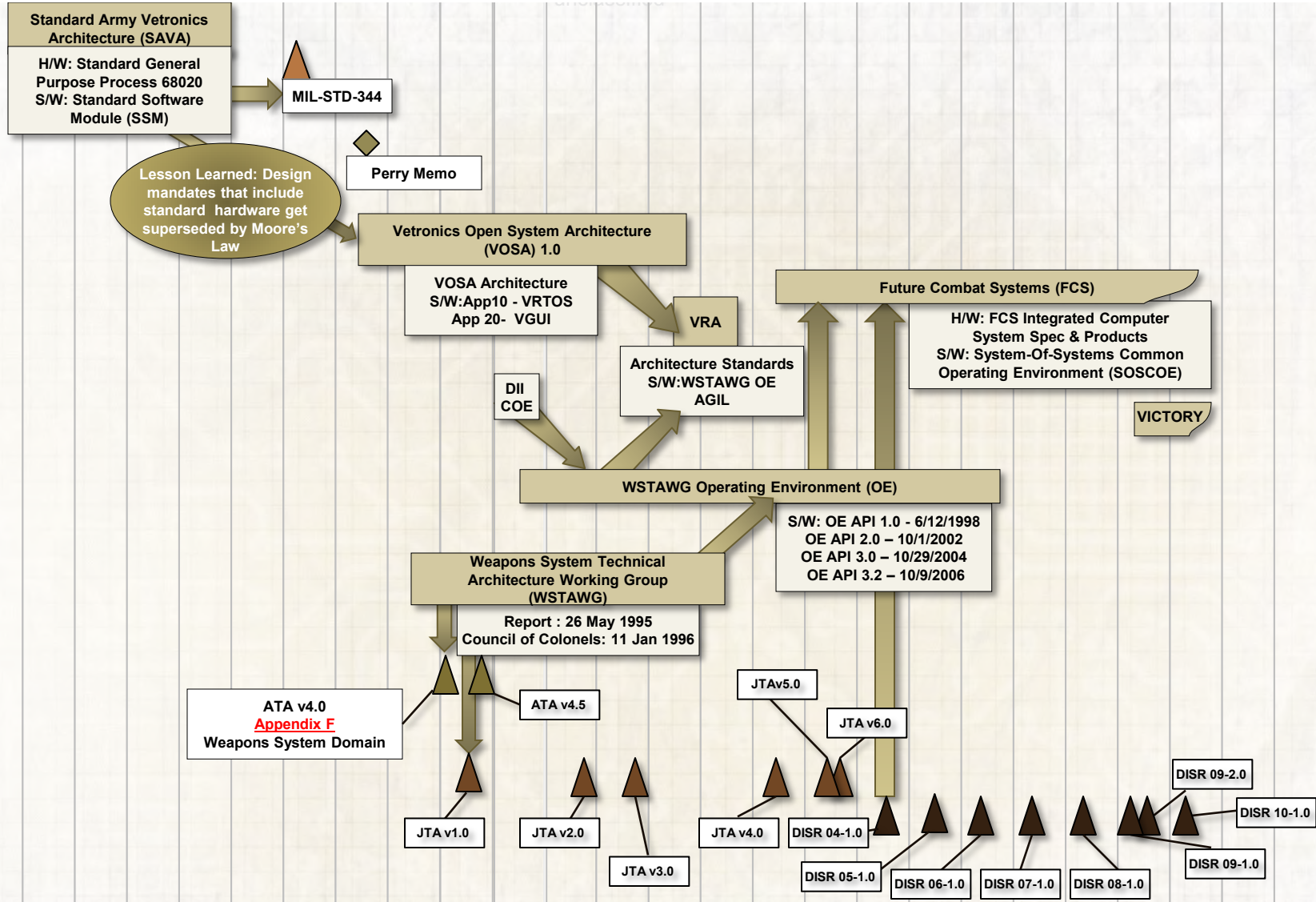


Enabling the Future Fight



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

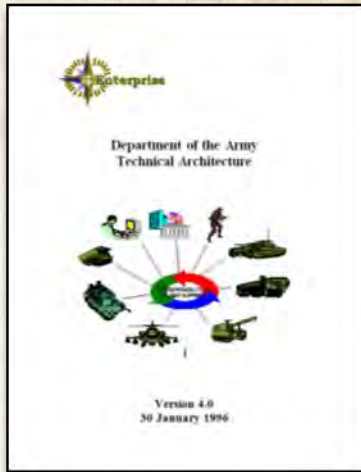
1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012



Legend:

- Military Standards (MIL STD)
- Army Technical Architecture (ATA)
- Joint Technical Architecture (JTA)
- DoD Information Technology Standard (DISR) published by Defense Information Systems Agency (DISA)
- Defense Information Infrastructure Common Operating Environment (DII COE)
- Vetronics Reference Architecture (VRA)
- Hardware (HW)
- Software (SW)

unclassified



Army Technical Architecture (ATA)



Joint Technical Architecture (JTA)

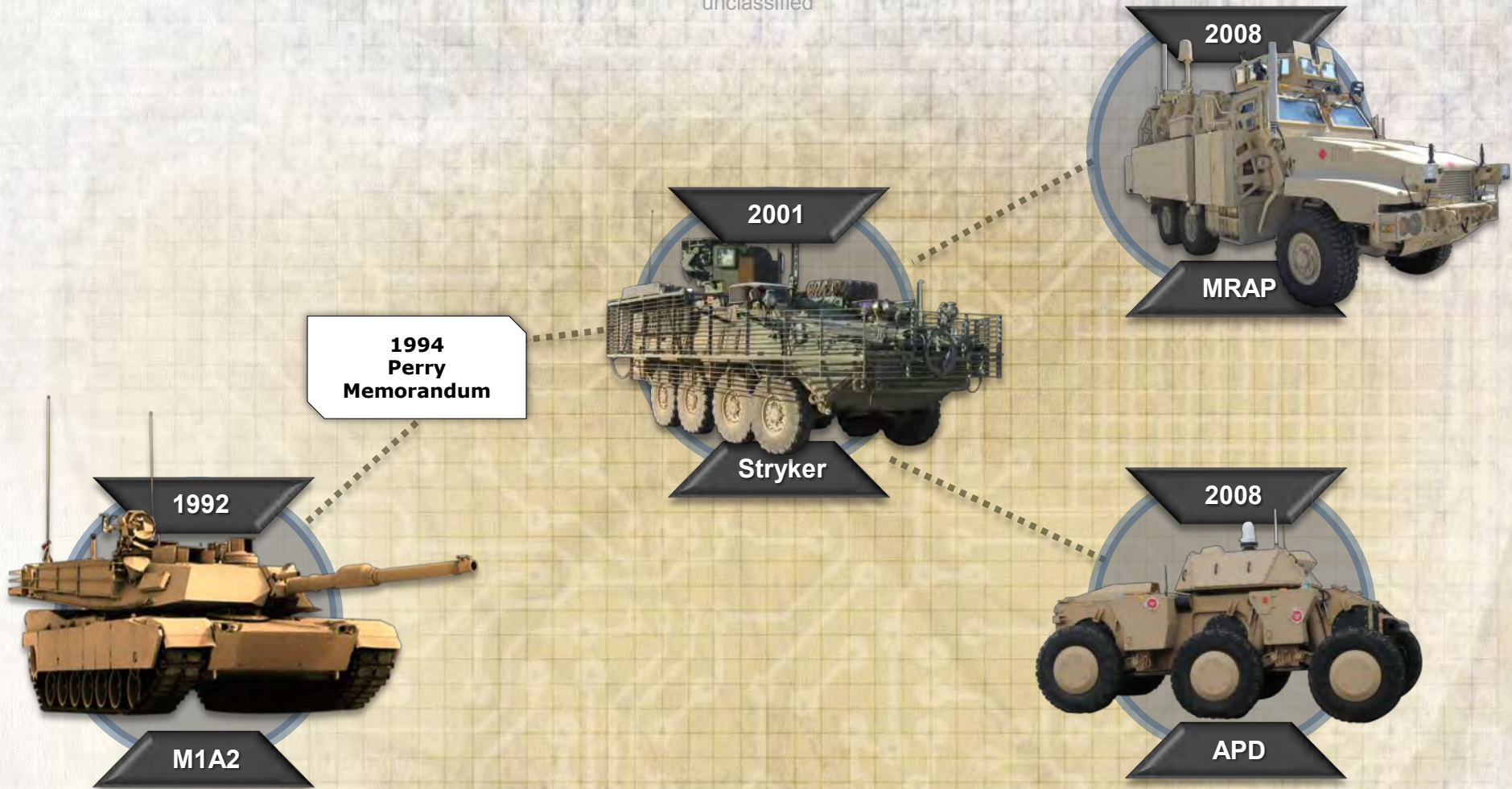


DoD Information Technology Standard (DISR)



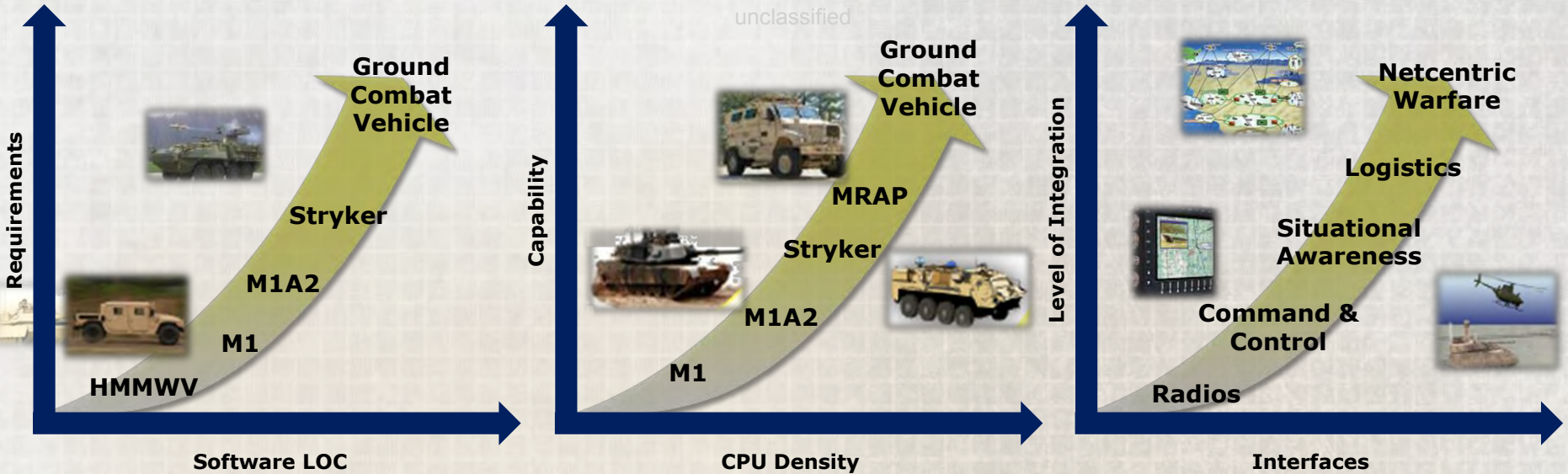
VEHICULAR INTEGRATION FOR C4ISR/ EW INTEROPERABILITY (VICTORY) SPECIFICATIONS

unclassified



The need for increasing Command & Control functionality has driven the need for more COTS

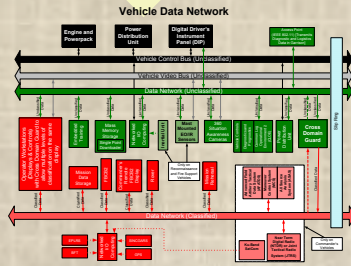
unclassified



Increasing Demands and Operational Flexibility Require Strategic Investments in Key Areas



Vehicle Networks



Architectures



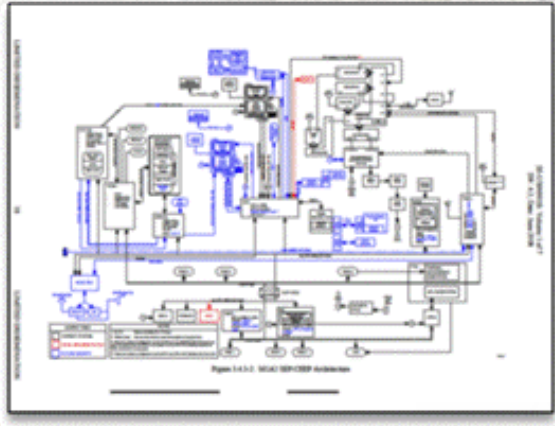
Computers



Software

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

unclassified



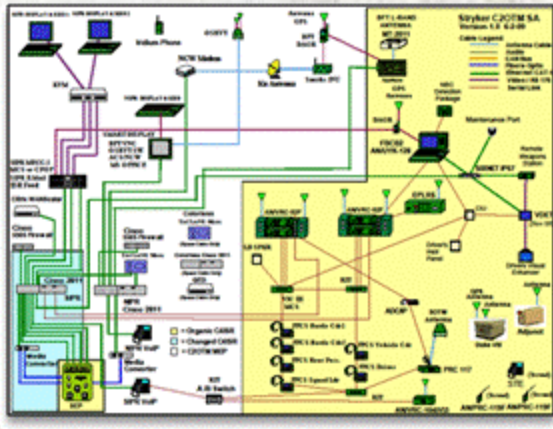
- **MIL STD 1553-based Architecture**
- **SINGARS Radios**
- **Digital Command, Control and Communications Capability**
- **Max Speed** - 42 mph (Governed)
- **Power/Weight Ratio** - 21.6 hp/ton
- **Vertical Obstacle** - 42 in
- **Ground Clearance** - 19 in
- **Gross Vehicle Weight** - 69.54 ton
- **Overall Length (Gun Forward)** - 387 in
- **Overall Width** - 144 in



1553 tightly coupled bus schedule

unclassified

unclassified



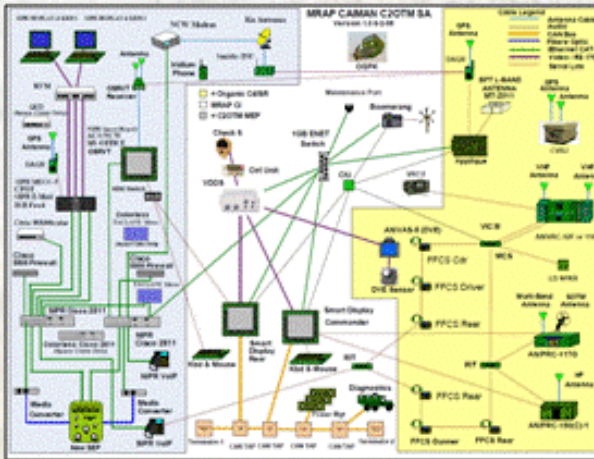
- **Ethernet**
- **Enhanced Position Location and Reporting System (EPLRS) Radios**
- **Extensive COTS Integration**
- **Max Speed - 62 mph**
- **Max Trench Crossing - 6.5 ft**
- **Gross Vehicle Weight - 18.12 ton**
- **Overall Length - 275 in**
- **Overall Width - 107 in**



First use of Ethernet as an interface to C2 systems

unclassified

unclassified



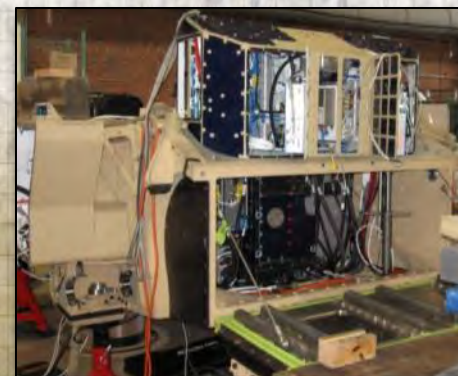
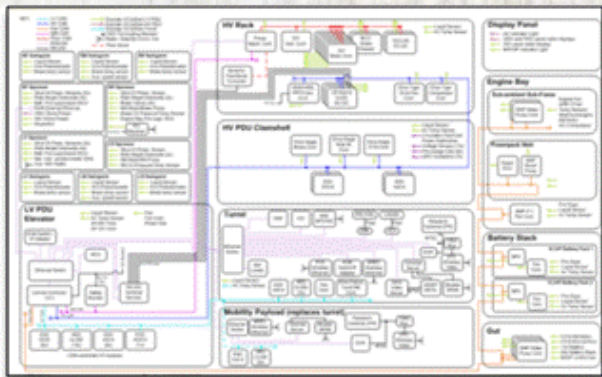
- **Gigabit Ethernet Backbone**
- **Data Radios and Satellite Communications**
- **19" COTS Multifunction Smart Displays**
- **Power Management**
- **Video Distribution**
- **Max Speed - 65 mph (Governed)**
- **Gross Vehicle Weight - 23 ton**
- **Overall Length - 257 in**
- **Overall Width - 102 in**



Extensive use of Ethernet & COTS equipment

unclassified

unclassified



- **Multiple CAN Busses & Gigabit Ethernet (GbE)**
- **COTS Data Radios – 802.11 Based**
- **Extensive COTS Components**
- **Max Speed - 50 mph**
- **Generator Output - 197 hp**
- **Battery Energy - 21.8 kW-hr**
- **Battery Max Power - 282 hp**
- **Power/Weight Ratio - 112 hp/ton**
- **Peak Torque - 41,368 ft-lb**
- **Vertical Obstacle - 39 in**
- **Trench - 39 in**
- **Fording - 20 in**
- **Gross Vehicle Weight - 9.3 ton**
- **Overall Length - 182 in**
- **Overall Width - 98 in**



Multiple CAN busses & Gigabit Ethernet as vehicle backbone

unclassified

Collaboration



unclassified

Standards & Requirements



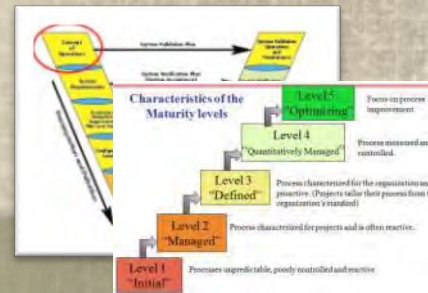
Commonality



Architectures



System Integration Laboratories



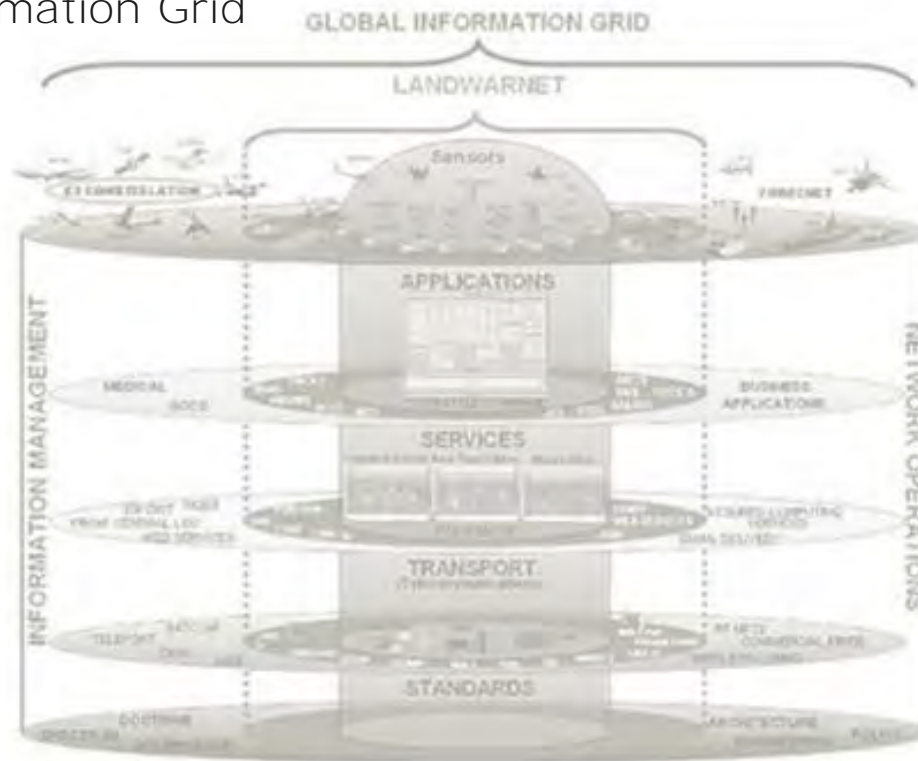
Systems Engineering & CMMI



Sustainment

unclassified

- Vehicle backbones will be based on 10 Gigabit Ethernet (GbE).
- Increase use of software Application Programming Interfaces (APIs).
- Need for increased radio throughput (10 megabyte/sec).
- Global Information Grid



We need to get Ethernet level throughput via radio networks if we want to get truly connected

unclassified

unclassified

****Disclaimer:** Reference herein to any specific commercial company, product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or the Department of the Army (DoA). The opinions of the authors expressed herein do not necessarily state or reflect those of the United States Government or the DoA, and shall not be used for advertising or product endorsement purposes. ******

unclassified

unclassified

BACK UP

unclassified

Description

- Leverages RDECOM and DoD capabilities in a repeatable process to apply rigorous systems engineering to ground systems integration
- Provides customer partners a single entry point for cost, schedule, performance and risk management of system integration projects

Accomplishments

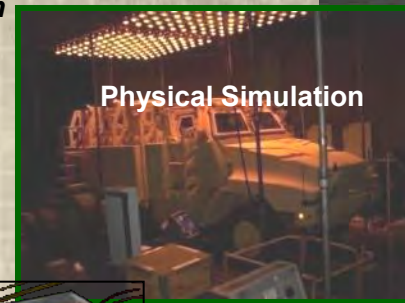
- Accelerated Remote Weapon Station Integration with ARDEC for the Caiman, MaxxPro and RG-33 systems
- Completed Full Capability Insertion Integration for Caiman Systems

Employs TARDEC organic Concepts, Analysis, Systems Simulation and Integration (CASSI), System Engineering (SE), Prototype Integration Facility and significant contributions from other RDECs and Organizations



Updated Architecture

RWS System Integration



Physical Simulation

MRAP Capability Insertion

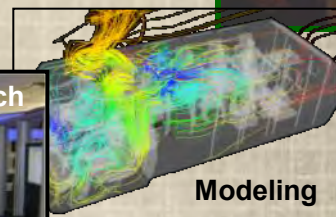
- Vanguard (ARDEC)
- CROWS II RWS (ARDEC)
- Boomerang (ARDEC)
- Double Shot (ARDEC)
- OGPK Overhead Protection (ARDEC effort)
- LRAS3
- Check 6 Camera
- Overhead Wire Mitigation
- IBIS TEK Lights
- RPG Protection
- Power Upgrade (derived requirement)
- C4I Architecture (derived requirement)
- Thrown Object Protection System

GVIC Projects :

- MRAP Capability Insertion
- C2OTM* – MRAP
- C2OTM* – Stryker
- LAV-R Upgrade
- RS-JPO

*Command & Control On The Move

C4 Integration Bench



Modeling

User Jury



unclassified

- The Digital Backbone is an architecture, with a set of C4ISR components, and Software that integrates communications, navigation, C2, video and other on-board electrical/digital systems into a common environment for enhanced user operation and local Situational Awareness.

- Digital Backbone components are common across MRAP FoV

- 2 Smart Displays



- High Speed Network



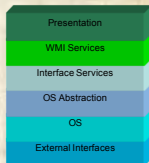
- Video and Data Distribution/Processing



- Power Management



- Software



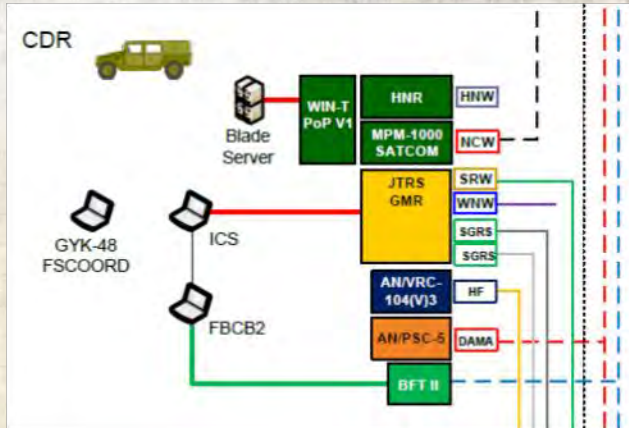
Digital Backbone Features

- Modular and open to manageable competitive configuration item level
- Scalable Software defined as services for applications and support
- Well defined and limited dependencies between components of software, hardware, and software to hardware
- COTS based at the component level
- User access to all functionality with common look and feel
- User task sharing/collaboration enabled and redundant back up
- Initial BIT and CBM concepts

- Digital Backbone enables future capability insertion further forward with reduced SWaP

unclassified

CP 11-12



Theater Driven Changes - quick reaction



MAJOR ONS/UONS/JUONS



INFRASTRUCTURE ECPS



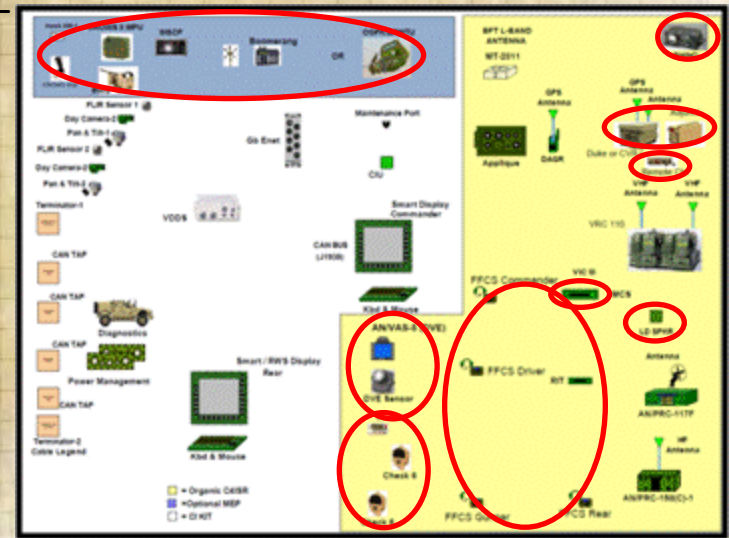
Network Integration Kit (NIK)

- Multi-Band Antenna (MBA) (2)
- Power Amplifier Group
- Personal Control Display Device (PCDD)
- HMMWV Integration A-11T
- Low Pass (LPF) (1)
- Joint Tactical Ground Mobile
- Integrated Computer System (ICS)
- Multi-Band Filter (M)

Legacy C4I

- Defense Advanced GPS Receiver (DAGR)
- Force XXI Battle Command Brigade & Below (FBCB2)
- VIC 3 Vehicle Intercom System (VIS)
- Blue Force Tracker (BFT) 2 Antenna
- Enhanced Position Location Reporting System (EPLRS)
- Single Channel Ground & Aviation Radio System (SINCGARS)

TPE



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

unclassified



MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

2010 Combat Vehicle Conference “Defining an Integrated, Networked Ground Combat Force for the Next Decade”



Equipping Warfighters to Win

Brigadier General Frank L. Kelley Commander
Marine Corps Systems Command
9 Nov 2010



MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

Mission

Overview

Vehicles

Power

Road Ahead



Mission: To serve as the Commandant's agent for acquisition and sustainment of systems and equipment used to accomplish the Marine Corps' warfighting mission

We will equip and sustain the Nation's expeditionary "Force of Choice" (MCVS 2025)



Overview

Vehicles

Power

Road Ahead

▶ We will continue to provide the best trained and equipped Marine units to Afghanistan. This will not change. This remains our top priority!

▶ We will rebalance our Corps, posture it for the future and aggressively experiment with and implement new capabilities and organizations.

▶ We will better educate and train our Marines to succeed in distributed operations and increasingly complex environments.

▶ We will keep faith with our Marines, our Sailors and our families.



MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

What the USMC does not need.

Overview

Vehicles

Power

Road Ahead

There is a reason why we flew the A-4M, AV-8B and will fly the JSF.

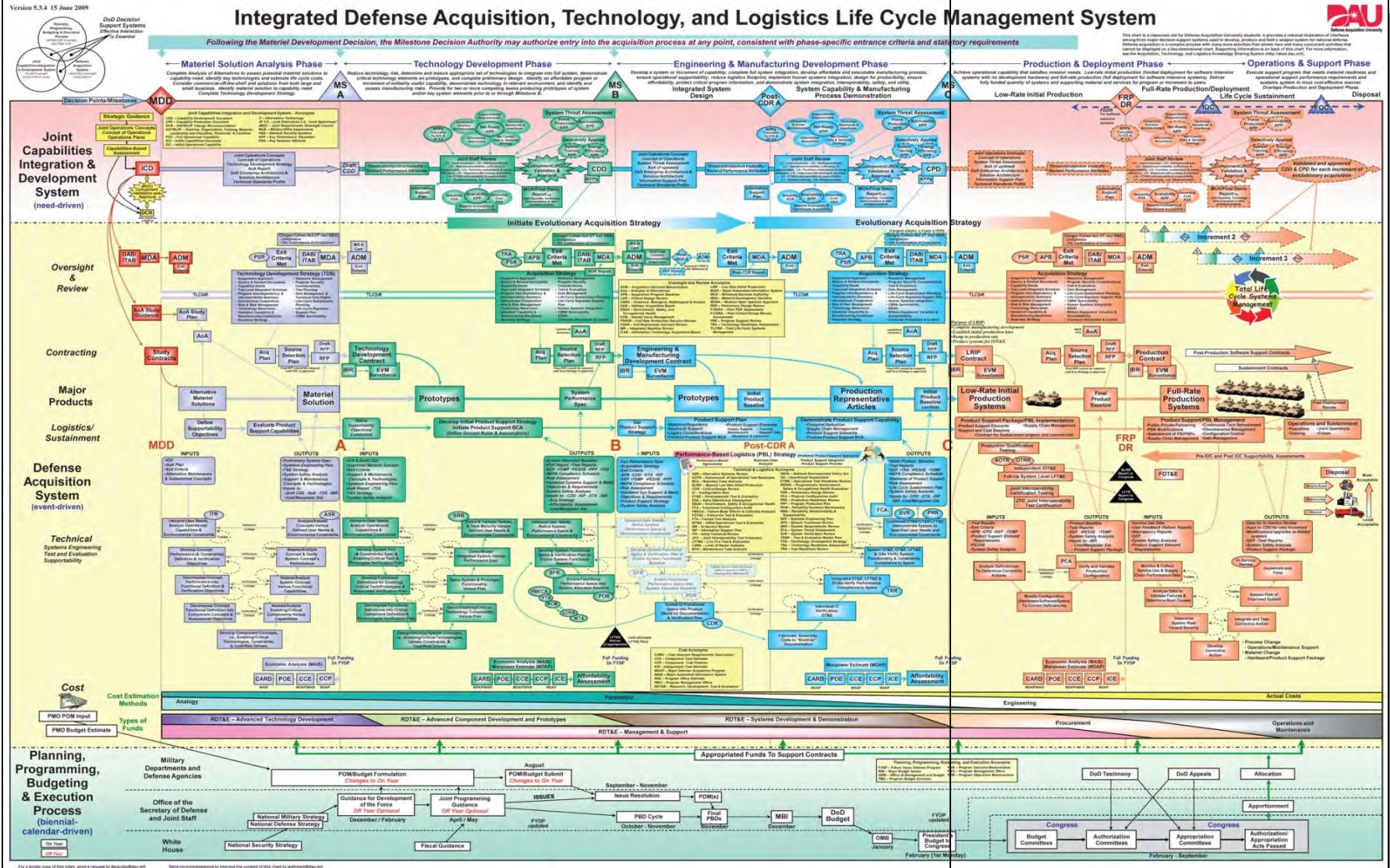




MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

Begin with the End in Mind





MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

Begin with the End in Mind

Strategy

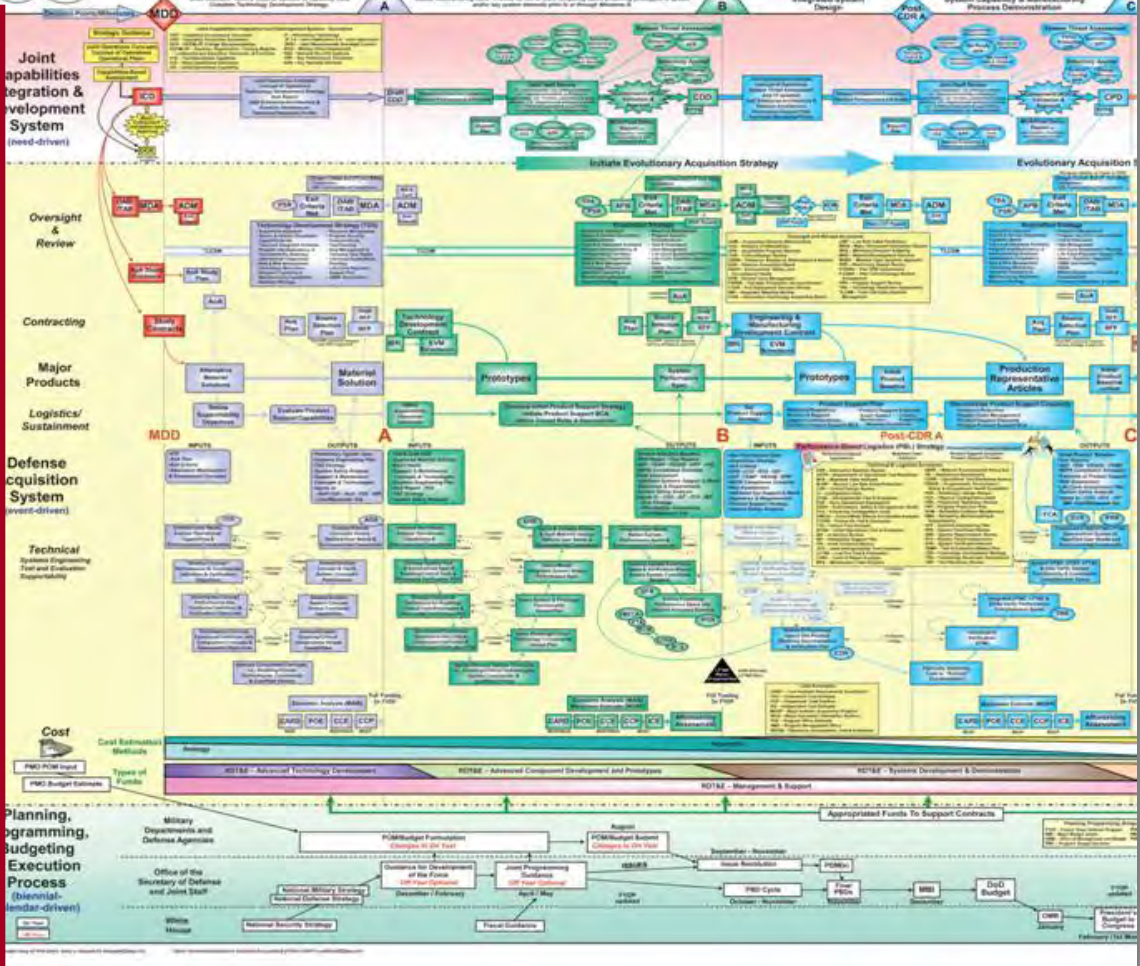
Acquisition

Funding

Road Ahead

Integrated Defense Acquisition, Technology, and Logistics Life Cycle Management System

Following the Material Development Decision, the Milestone Decision Authority may authorize entry into the acquisition process at any point, consistent with phase-specific entrance criteria and statutory requirements



SUSTAINMENT



- We must provide the nation the **BEST VALUE** in terms of vehicle capabilities.
- Requirements must be managed more closely...procurement cost will be a systems attribute.
- Operating and maintenance cost will be a system attribute.
- USMC vehicles have grown too heavy; we need to re-emphasize our mission requirements for amphibious and expeditionary operations.
 - We must limit vehicle weights for Navy Amphibious Ships.
- Vehicles need to be multi-capable, share common components, training and sustainment capabilities.

Expeditionary vehicles are maneuverable, capable, lethal and reliable.



Joint Lightweight Tactical Vehicle (JLTV)

1. Has KSA for fuel efficiency
2. Will address KSA in construct of Fully Burdened Cost of Fuel (FBCF) on the battlefield (FBC)



Fully Burdened Cost of Fuel (FBCF)

- Cost of fuel; in addition to commodity costs, includes all costs up to the point of sale to include cost of product, transportation, intermediate storage and distribution facilities, maintenance and upkeep costs, DESC labor and overhead costs, etc..
- Cost of logistics tail; includes fuel delivery asset operations and support cost, fuel delivery asset depreciation cost, direct and indirect fuel infrastructure costs, environmental costs, and other unique costs
- Cost of force protection which includes the resources necessary to secure fuel delivery

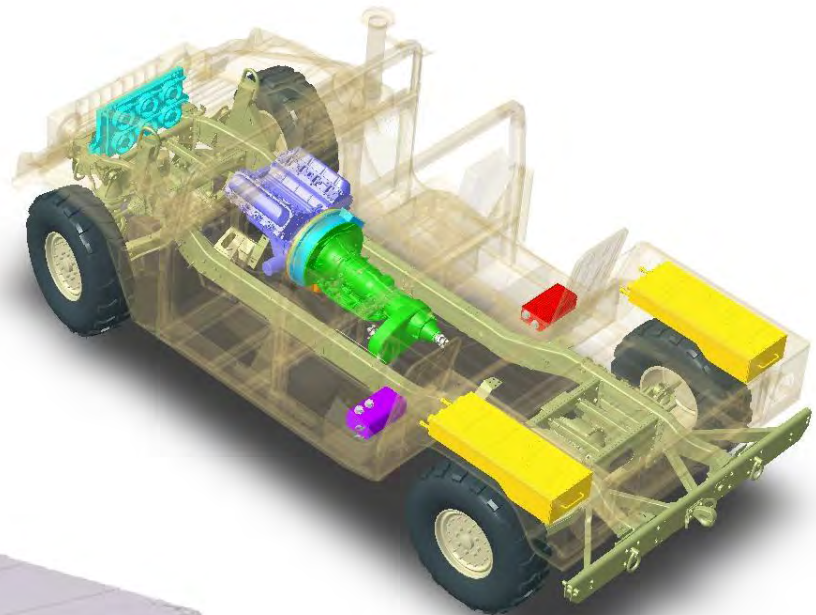
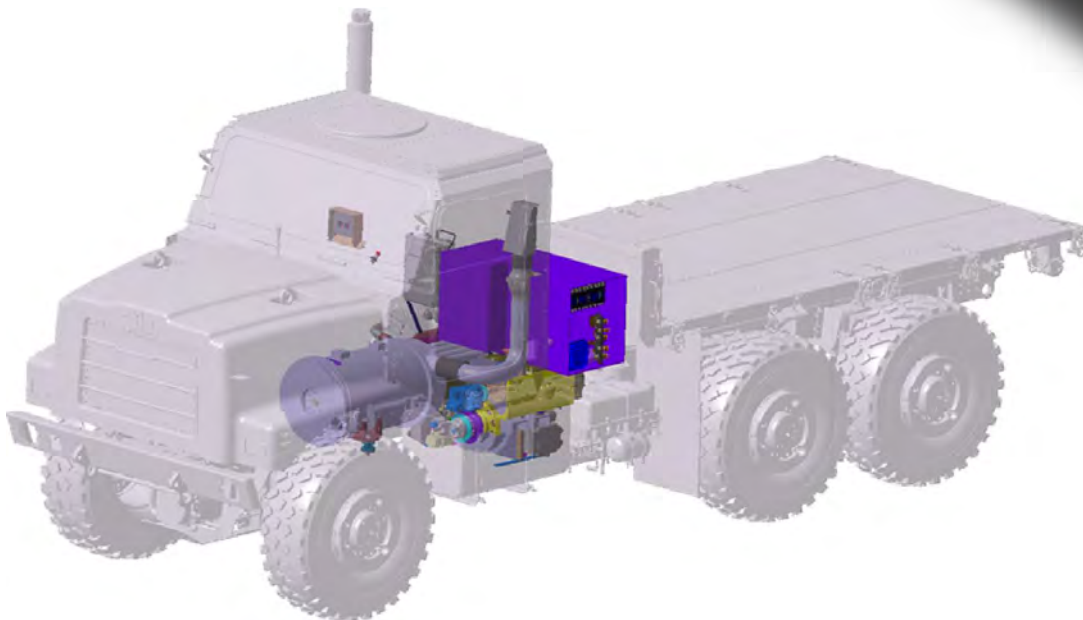
Defense Energy Support Center (DESC) , ,
Defense Logistics Agency (DLA)

3. Fuel efficiency adjusted for MPG and Weight - addressed as Ton-Miles per Gallon



On-Board Vehicle Power (OBVP) Systems

Fuel efficiency and on-board vehicle power will help lighten the load on carrying fuel resupply to the ExFOBs.





MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

Ground Renewable Expeditionary Energy Networks (GREEN)

Overview

Vehicles

Power

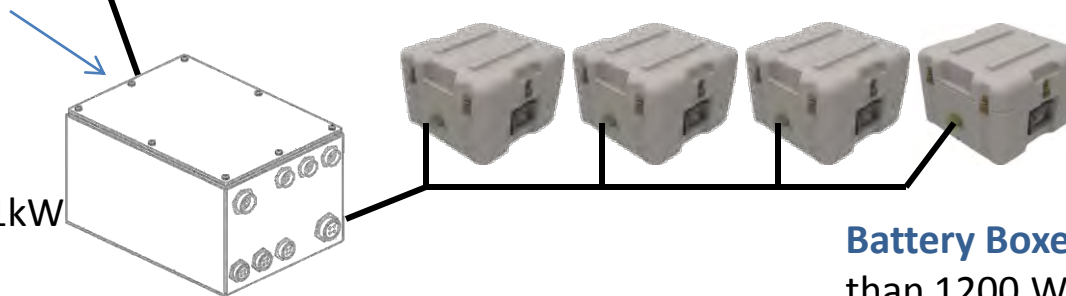
Road Ahead

Solar panels: 8 total, 205W each, 2 per container. Each half container (w/ panel) is 2 man lift.



GREENS controller:
4x Solar inputs
4x Battery connections
1x AC input
1x DC input

28 VDC output
300W continuous, 1kW peak.



Battery Boxes: 4 total, each more than 1200 Whr, Each battery box is a 2 man lift. Current design uses Lithium ion for increased life and energy density over LeadAcid

GREENS controller takes power from solar input, supplies load and send remaining to charge batteries. Batteries supply power during the night. Total energy per day 7200 Whr (300W 24/7)

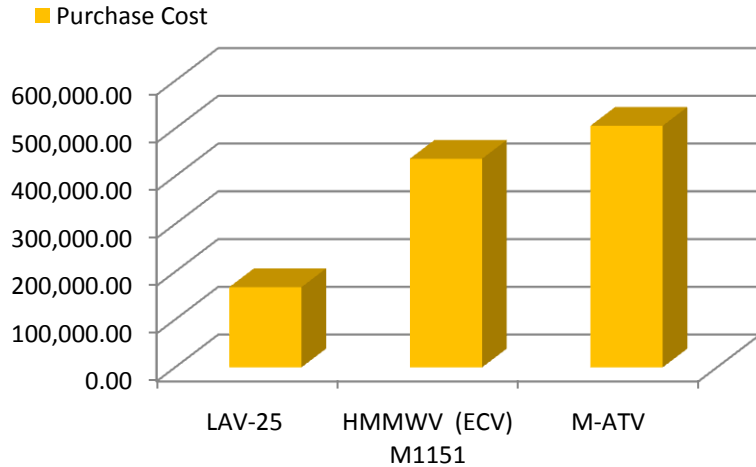


MARINE CORPS SYSTEMS COMMAND

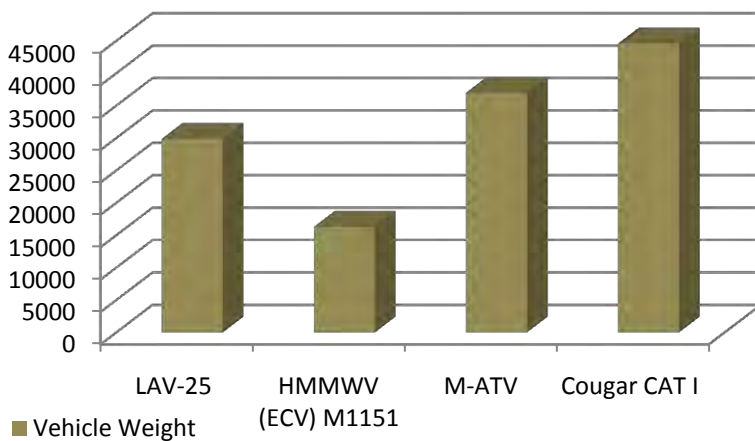
EQUIPPING THE WARFIGHTER TO WIN

The Nation needs the "best value"

Purchase Cost



Vehicle Weight



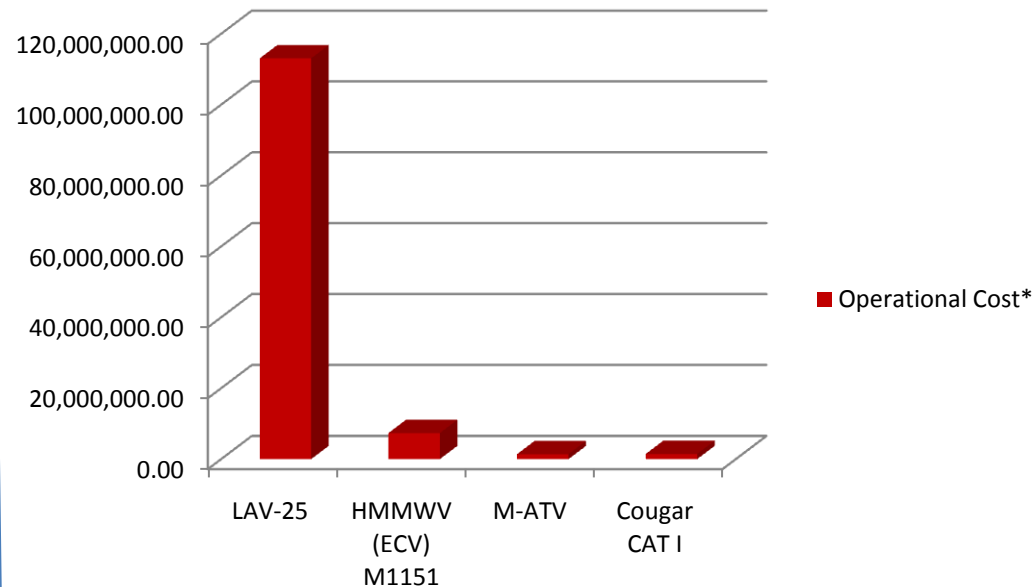
Overview

Vehicles

Power

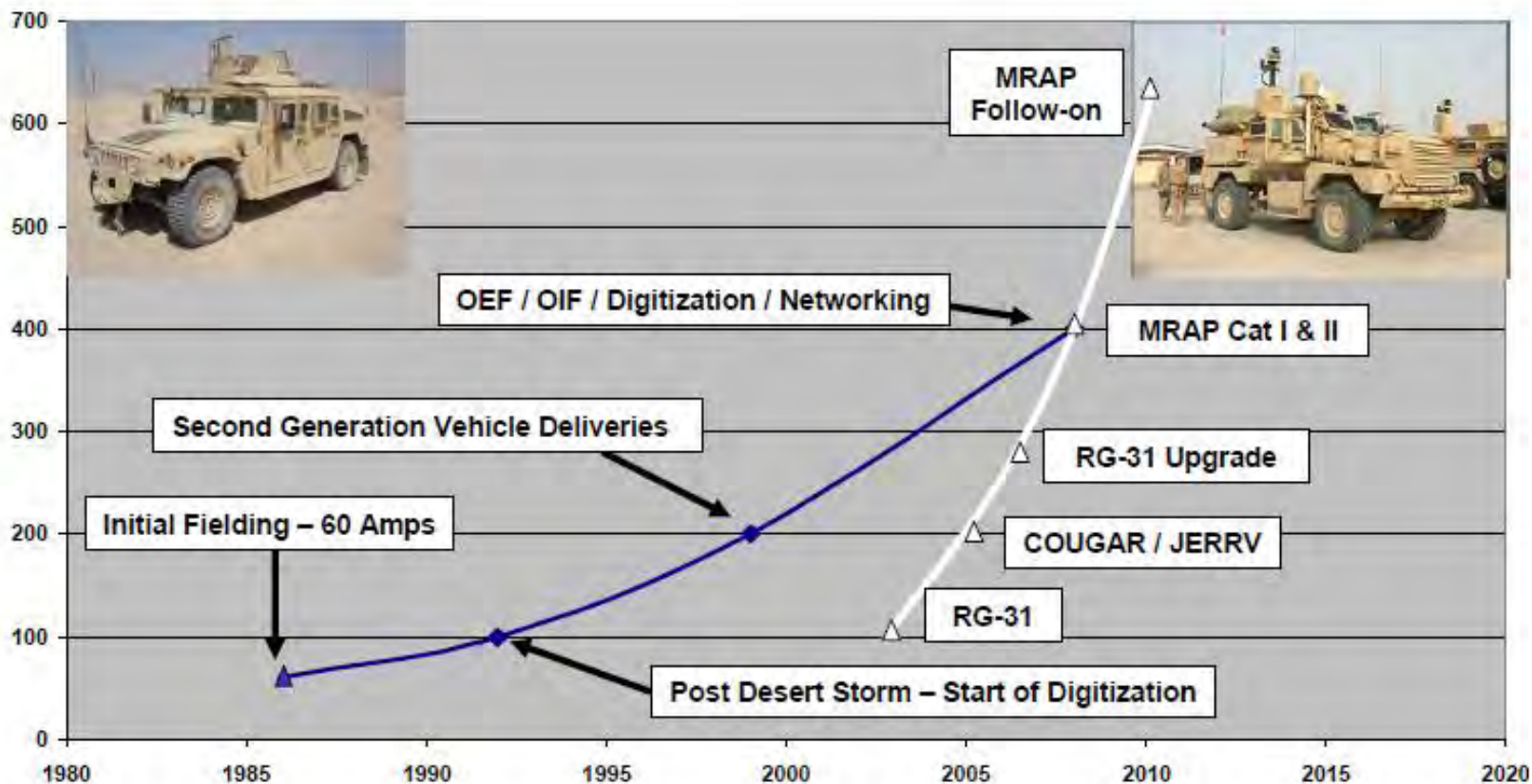
Road Ahead

Operational Cost*





Alternator Amperage Rating on HMMWV / MRAP at 28 VDC

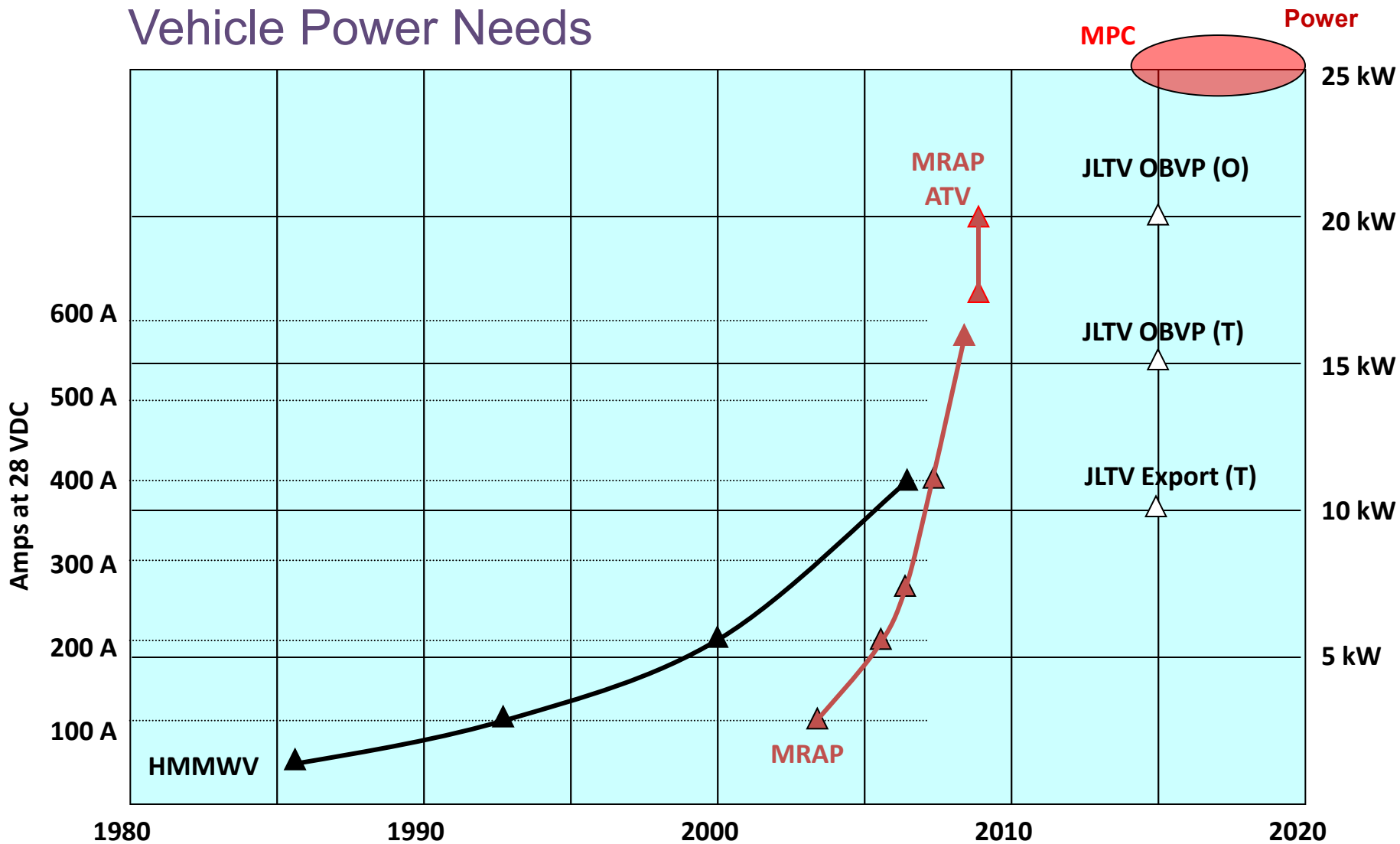




MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

Vehicle Power Needs

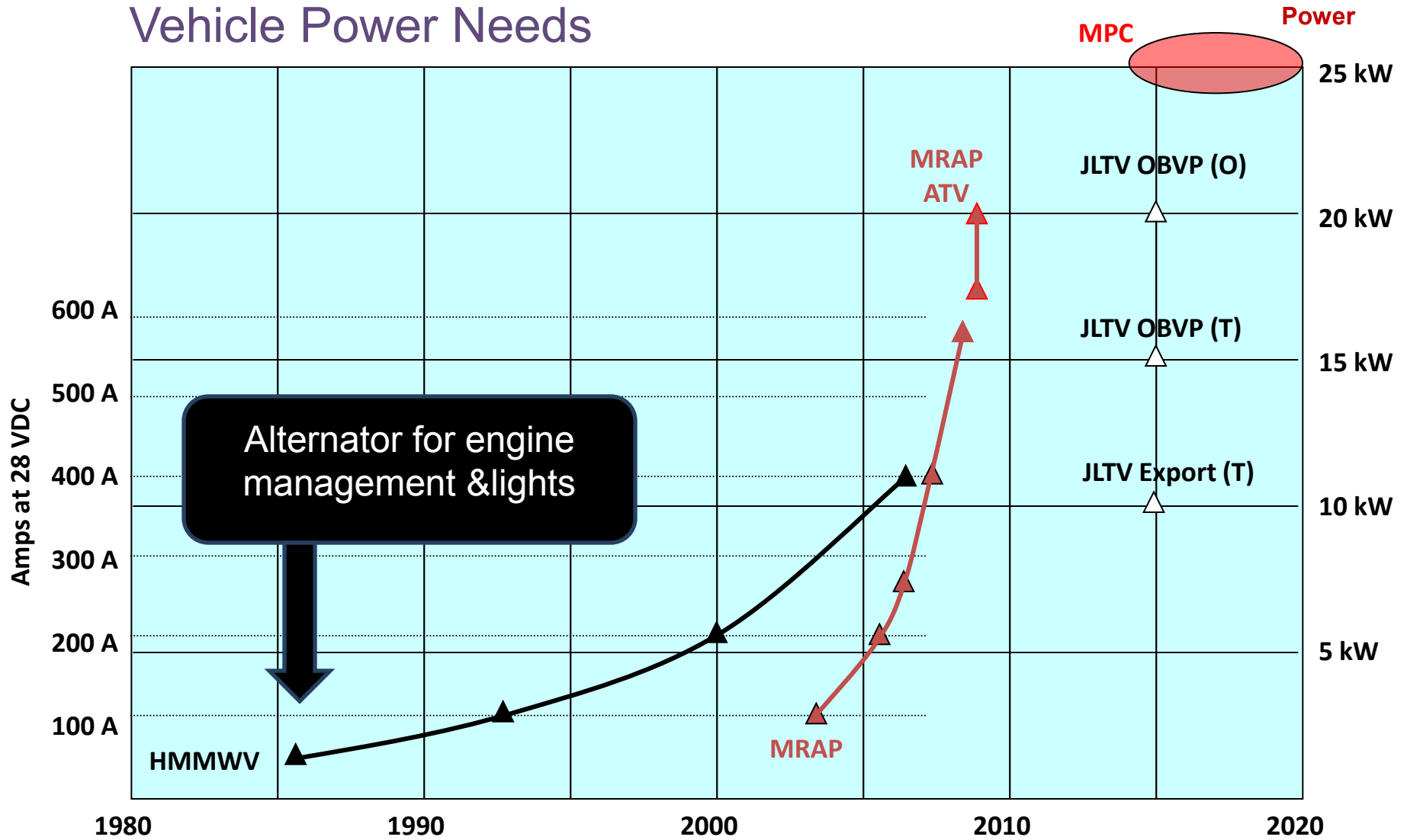




MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

Vehicle Power Needs



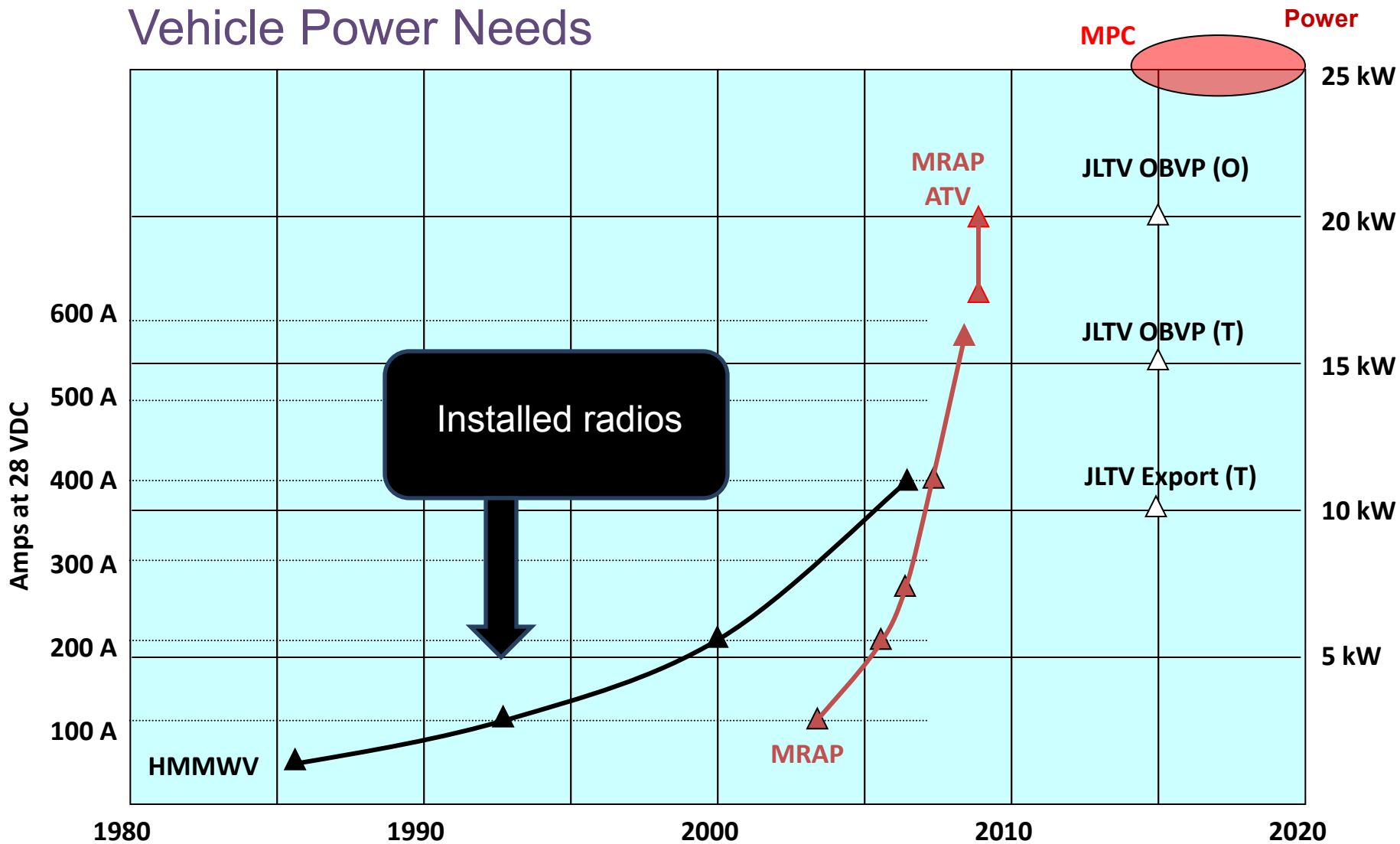
Alternator for engine management & lights



MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

Vehicle Power Needs

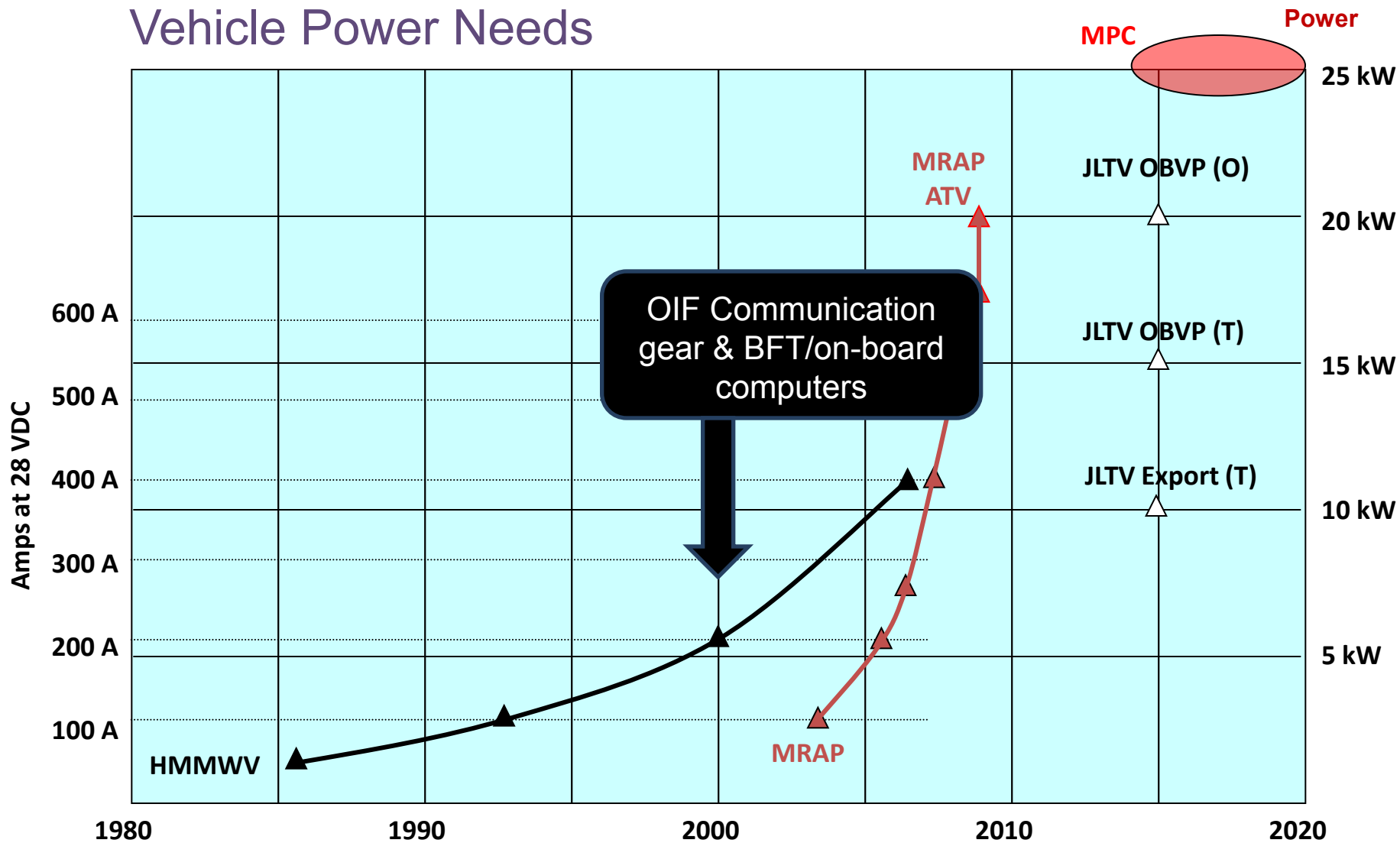




MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

Vehicle Power Needs

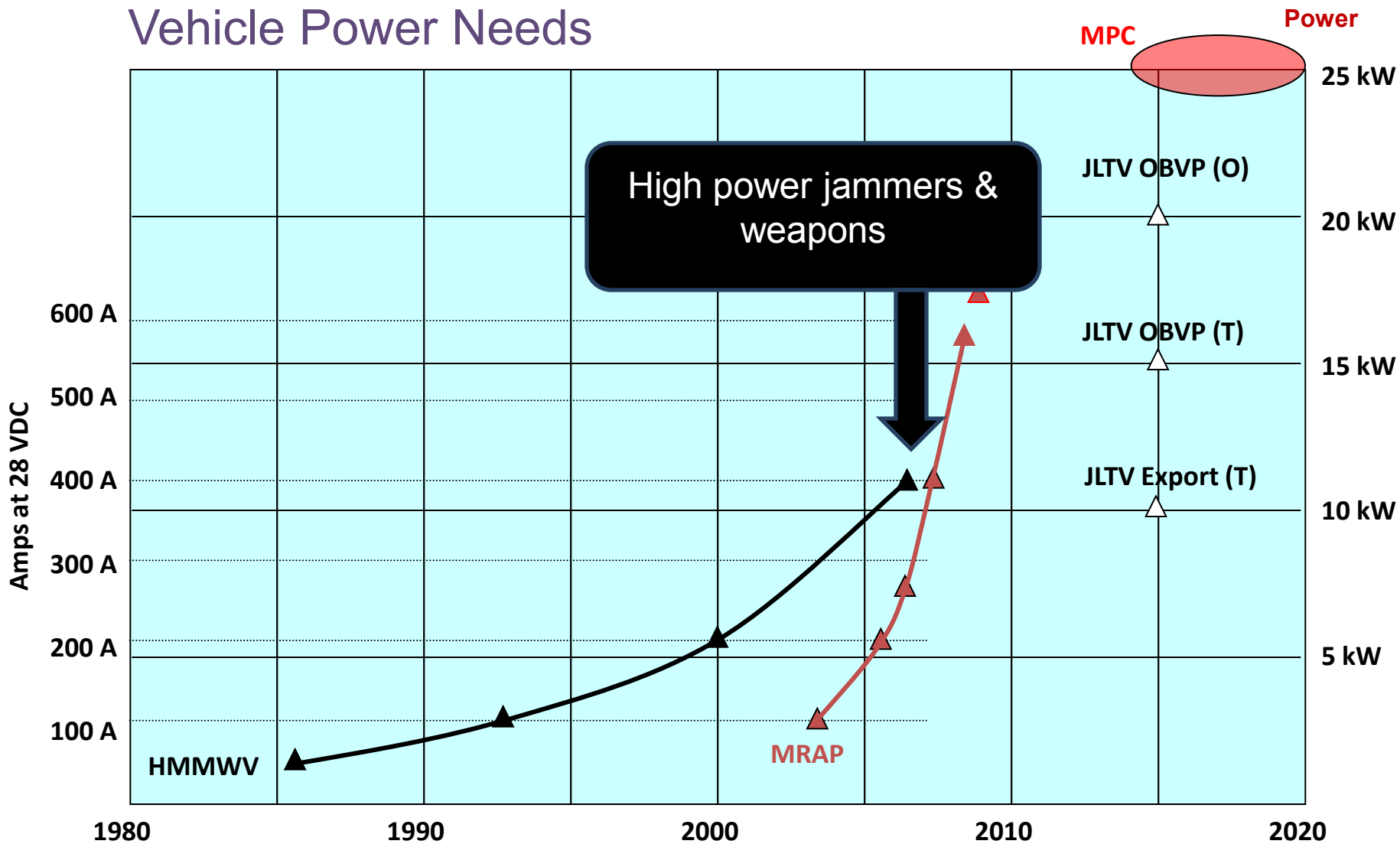




MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

Vehicle Power Needs

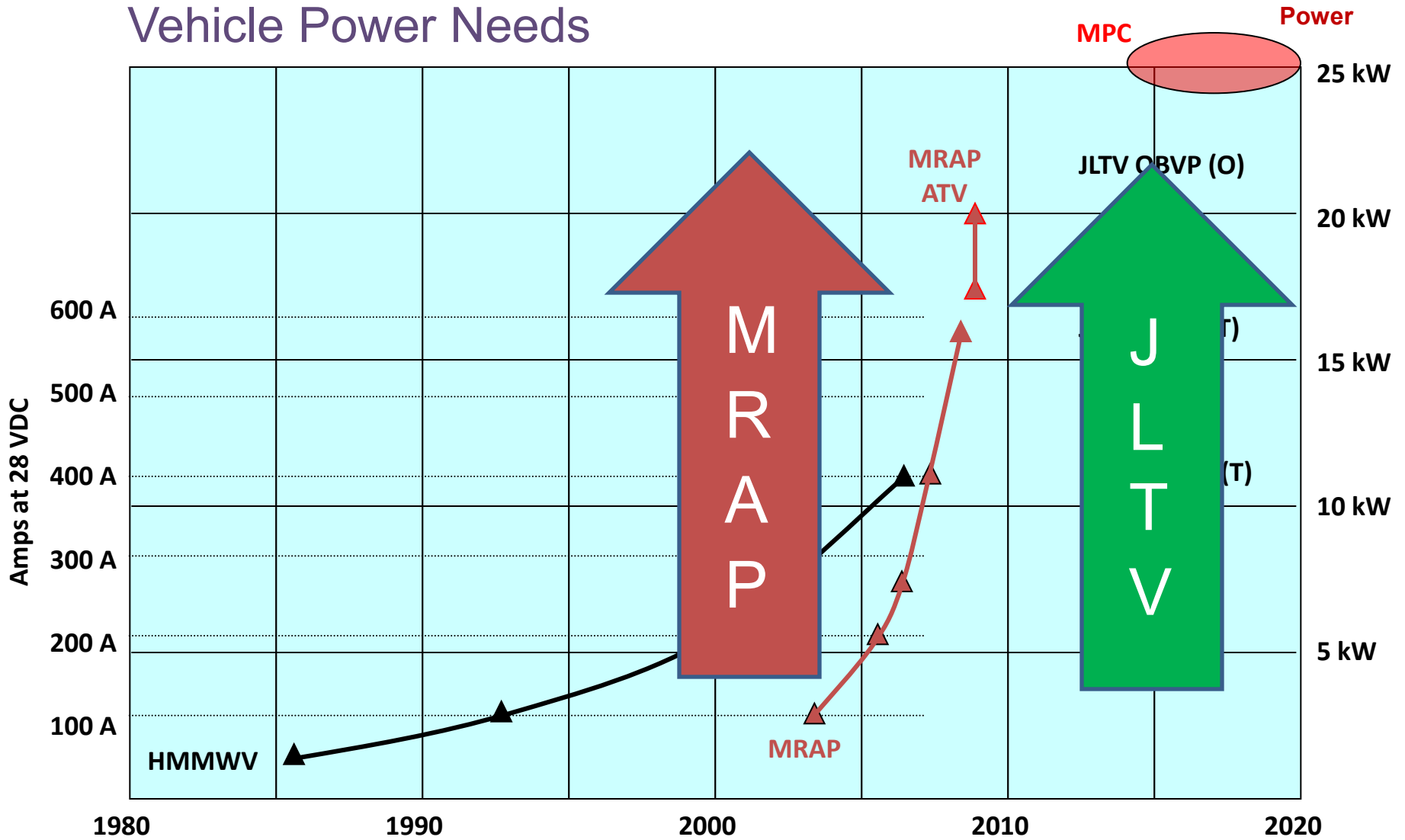




MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

Vehicle Power Needs





MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

“Connected Vehicles”





MARINE CORPS SYSTEMS COMMAND

EQUIPPING THE WARFIGHTER TO WIN

Questions





EXPEDITIONARY FIGHTING VEHICLE (EFV)



Program Brief 9 Nov 2010



EFV MISSION



**Provide High Speed
Transport of Embarked
Marine Infantry From Ships
Located Beyond the Horizon
to Inland Objectives**



**Provide Armor Protected
Land Mobility and Direct
Fire Support During Combat
Operations**



EFV

MISSION ESSENTIAL FUNCTIONS



Move (Land)



Move (Water)



Shoot



Communicate



Carry



Protect



PROGRAM STATUS



KEY PERFORMANCE PARAMETERS

CRITERIA

THRESHOLD

OBJECTIVE

High Water Speed - 2' significant wave height, for not less than 1 continuous hour

20 knots

25 knots

Land Speed - Forward speed on hard surface road

69 kph

72 kph

Firepower - Maximum effective range
Interoperability/standard ammunition with other service(s)

1500m

2000m

Armor Protection - Any azimuth

14.5mm/300m

30mm/1000m

Reliability - Mean Time Between Operational Mission Failure

43.5 hrs

56 hrs

Carrying Capacity

17 Marines


18 Marines


Net Ready

* Compliance based on IA, GIG-KIPs, & SDE testing

100% of designated enterprise-level or critical interfaces & services

100% of all enterprise-level & critical interfaces & services

 Currently Demonstrated

 Plan to Demonstrate



INTEROPERABILITY WITH MARINES

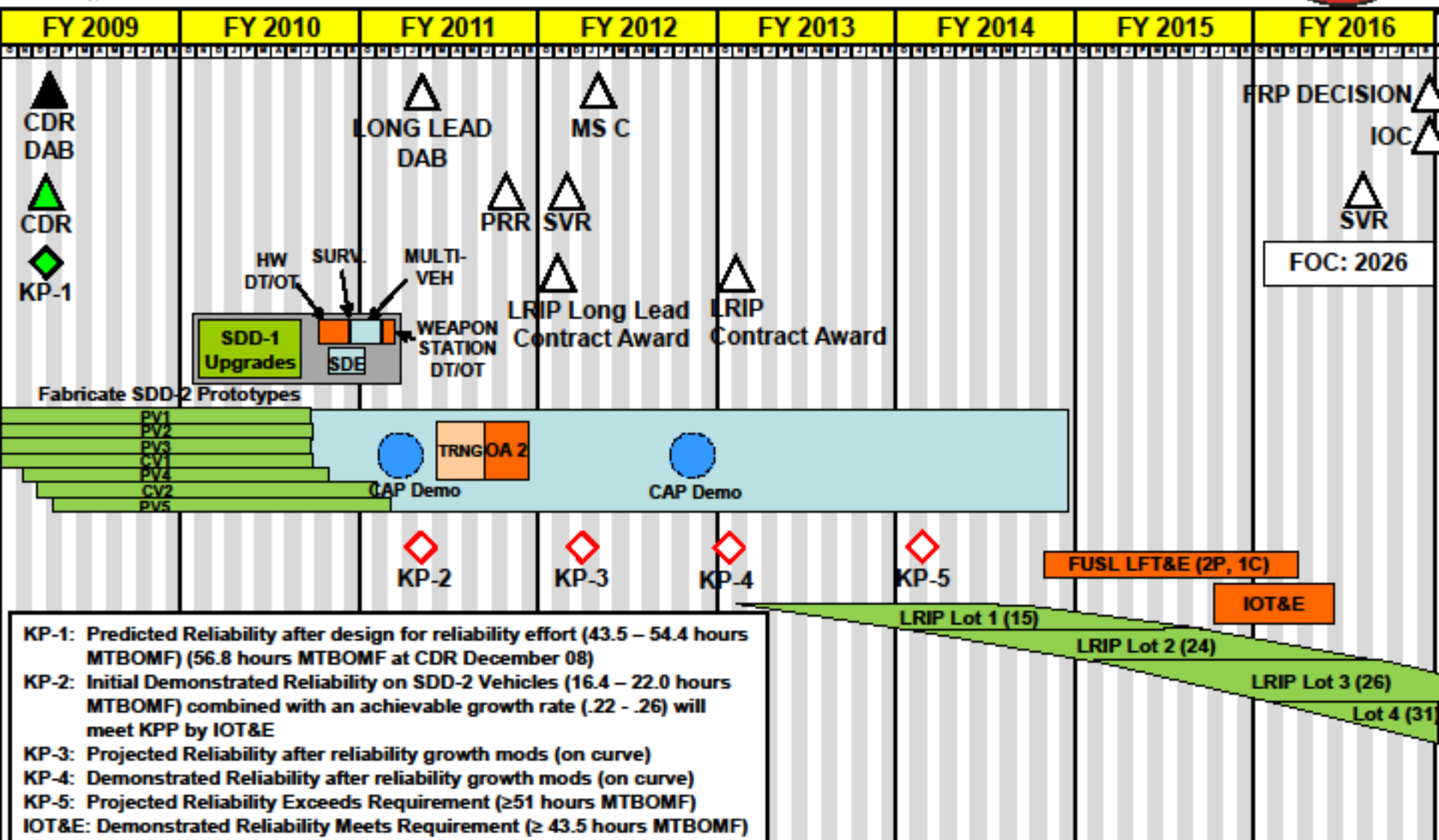


- **The EFV design provides an integrated, on-the-move, interoperable, C2 capability that supports all C2 requirements of the Squad, Platoon, Company (EFVP1) and the Battalion and Regiment (EFVC1).**



EFV PROGRAM DETAIL SCHEDULE

PER PB-11 BUDGET CONTROLS





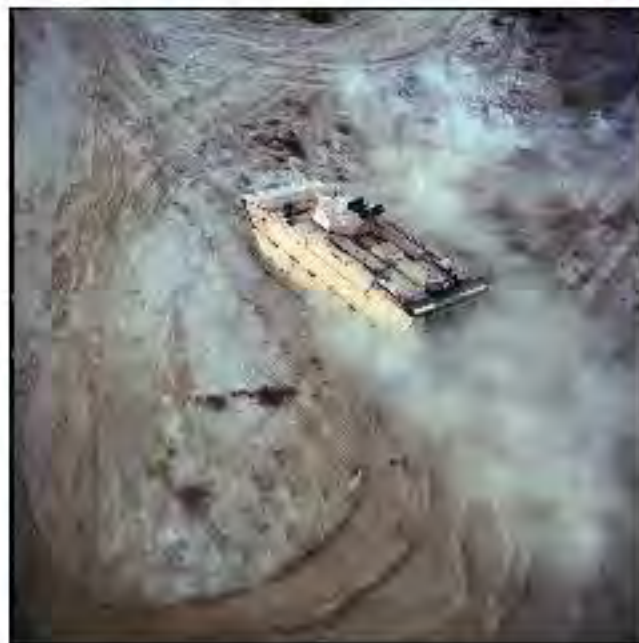
TECHNOLOGY INTERESTS



Cooling System Improvements

Blast Resistant Seats

Lightweight Armor Improvements



Survivability Improvements

Armor Upgrade Kits

Heat Resistant Materials

Self-Sealing Fuel Tanks



Combat Vehicle Conference

9 NOV 2010

Mr. Scott Davis

**Program Executive Officer,
Ground Combat Systems**



Agenda

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

- **Introduction/PEO GCS Overview** **Mr. Davis**
- **Heavy Brigade Combat Team** **COL Sheehy**
- **Stryker Brigade Combat Team** **LTC Schirmer**
- **Lightweight 155 Howitzer** **Mr. Gooding**
- **Robotics** **LtCol Thompson**
- **Panel Discussion** **All**

OUR MISSION IS OUR WARFIGHTERS' FUTURE



PEO GCS Overview

9 November 2010

Mr. Scott Davis

**Program Executive Officer,
Ground Combat Systems**

Program Executive Office Ground Combat Systems

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS



6,000 Robotic Platforms

ROBOTIC SYSTEMS
JOINT PROJECT OFFICE



(Army & Marine)

- X-bot
- M-160
- TALON
- MARCbot

3,324 Stryker Platforms

PROJECT MANAGER
HEAVY BRIGADE COMBAT TEAM



- Stryker Family of 10 vehicles

1,800 Towed Cannons

Towed Artillery for the 21st Century



(Army & Marine)

- M777A2
- M119A2
- M198
- M111 IPADS
- D30

PEO GCS PORTFOLIO

6,118 Abrams FoV

TEAM
ABRAMS



- Abrams Tank
- M88 Recovery Vehicle
- Bradley Fighting Vehicle
- Paladin / FAASV
- M113
- Knight

**13,441 M113
6,452 Bradley**

TEAM
BRADLEY/M113



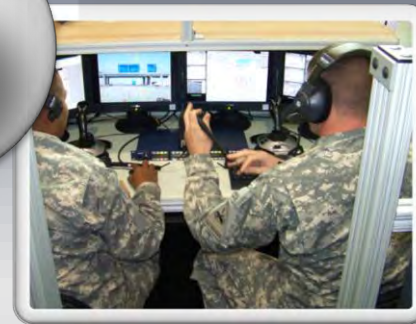
3,962 Fire Support Platforms

PRODUCT MANAGER
FIRE SUPPORT PLATFORMS



GCV

GROUND COMBAT VEHICLE



OUR MISSION IS OUR WARFIGHTERS' FUTURE



Strategic Environment

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

- **Operational**

- Persistent conflict
- Hybrid threats requiring hybrid solutions
- Advanced/improvised technologies targeted against combat vehicles



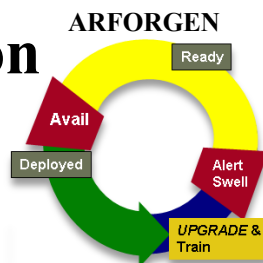
- **Budget**

- Pressure to cut defense & other spending
- Topline base budget expected to have modest, but steady growth
- “Do more without more”



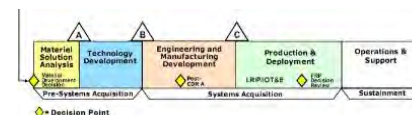
- **Army Modernization**

- BCT-centric
- Buy fewer, more often
- Incremental fielding of capability thru ARFORGEN



- **Acquisition Reform**

- Increased competition throughout acquisition process
- Reduced tolerance for cost/schedule risk
- Revised Milestone certification reqs



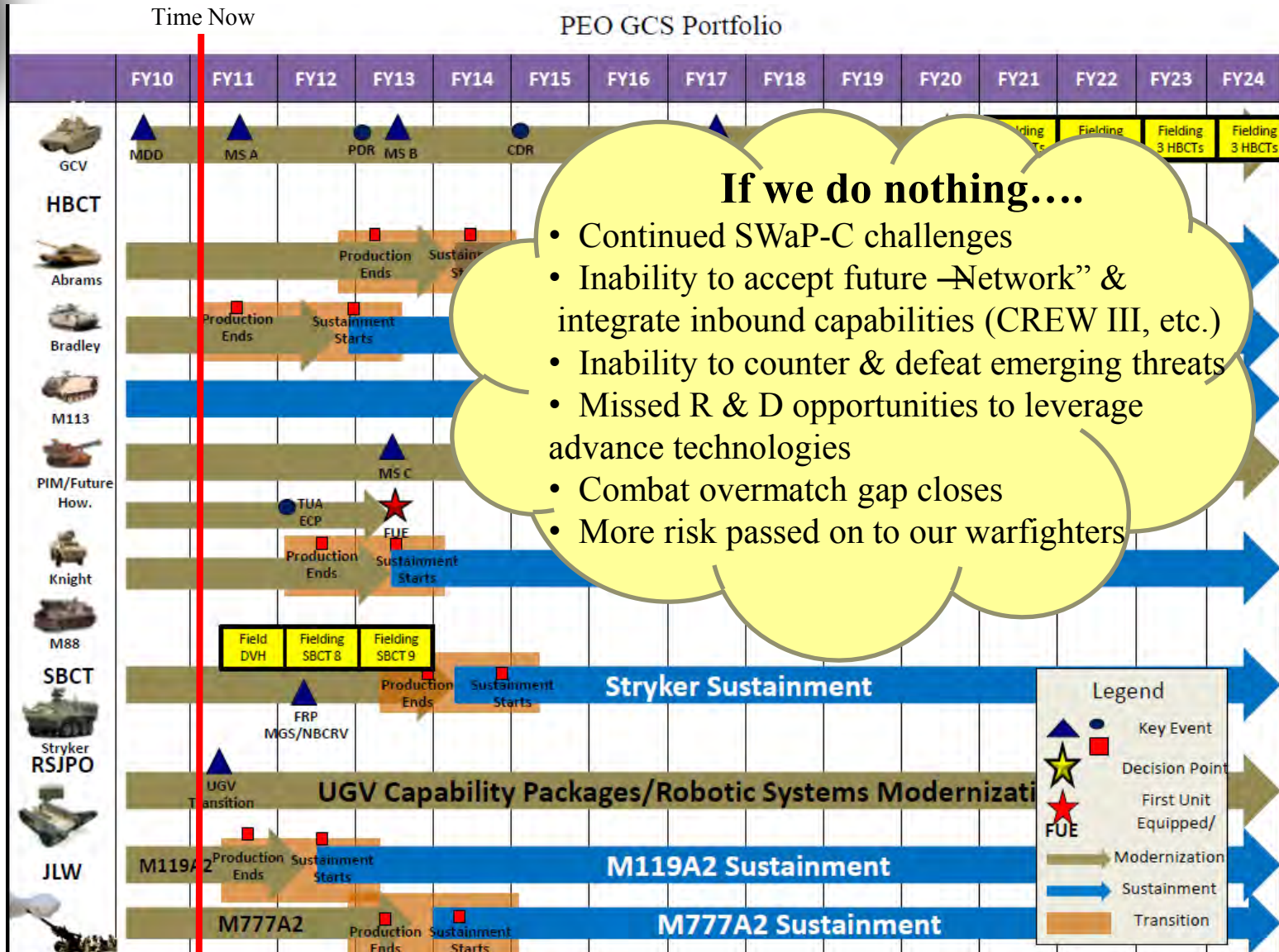
Uncertainty, Complexity, and Constant Change

OUR MISSION IS OUR WARFIGHTERS' FUTURE



PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

Where We Are Today – If We Don't Execute Modernization?

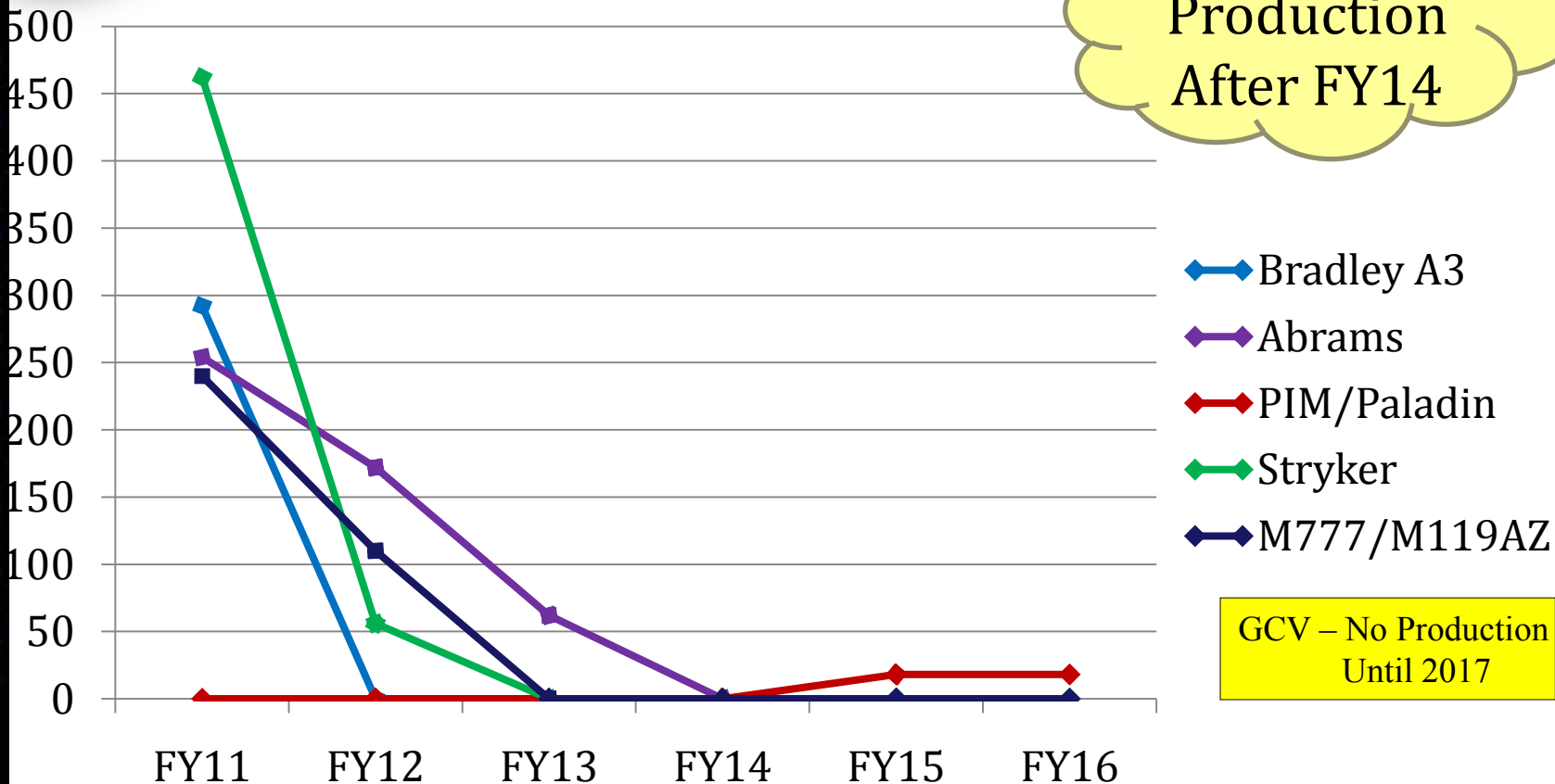


OUR MISSION IS OUR WARFIGHTERS' FUTURE



PEO GCS Production Status

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS



Only PIM in Production After FY14

GCV - No Production Until 2017

OUR MISSION IS OUR WARFIGHTERS' FUTURE



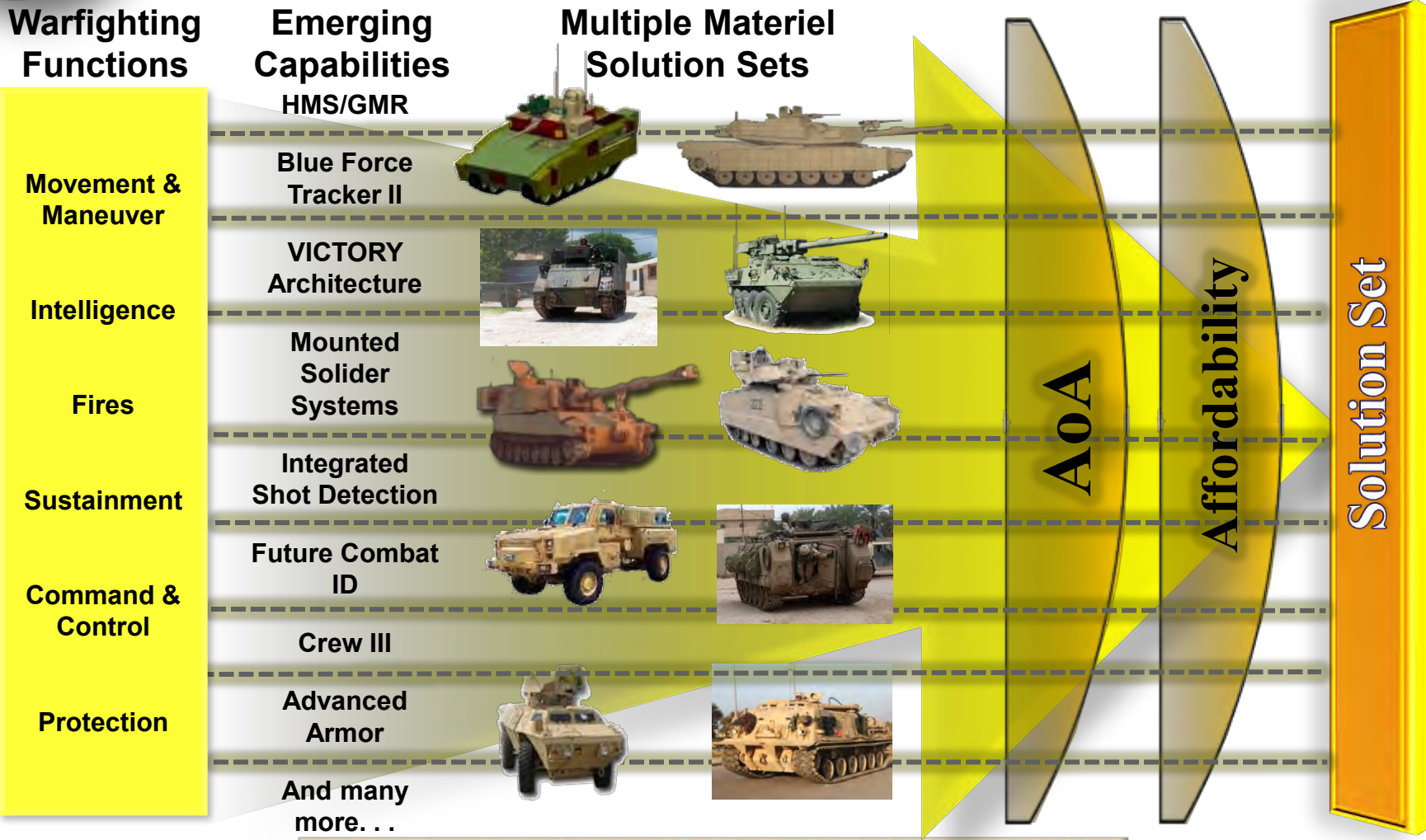
Key Implications

- Systems unable to add new capability, and in some cases, can't add planned capability
- Industrial and organic base, both engineering and manufacturing will atrophy
- Systems will continue to perform below their currently approved performance attributes
- Systems will transition to sustainment – Requires typically scarce SSTS funding limits critical platform upgrade
- Program R&D funding will continue to leave the portfolio



How do we provide an Integrated BCT Capability?

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS



OUR MISSION IS OUR WARFIGHTERS' FUTURE



Thinking/Operating Like a Business

- **“Do more without more”– maximize capability with resources available**
- **Ensure from inception that requirements are affordable, and once initiated, programs control costs to achieve affordability requirements**
- **Align workforce, processes, and business systems to BCT/ARFORGEN-centric construct**
- **Use deliberate systems engineering processes and collaboration to overcome inflexibility of legacy constructs**
- **Develop and implement effective leading indicator performance management metrics**
- **Focus on results**

OUR MISSION IS OUR WARFIGHTERS' FUTURE



Integrated Capability Management

Today



New Approach

The Future



- Platform-centric and disparate capabilities
- Internal/external subsystem driven integration
- Modernization thru appliqué solutions
- Box mentality—more hardware for every added function
- Multiple Network systems with incompatible hardware, operating systems, databases, and security configurations
- Duplication of functionality, computing, and displays
- Key source of increasing SWaP-C burden

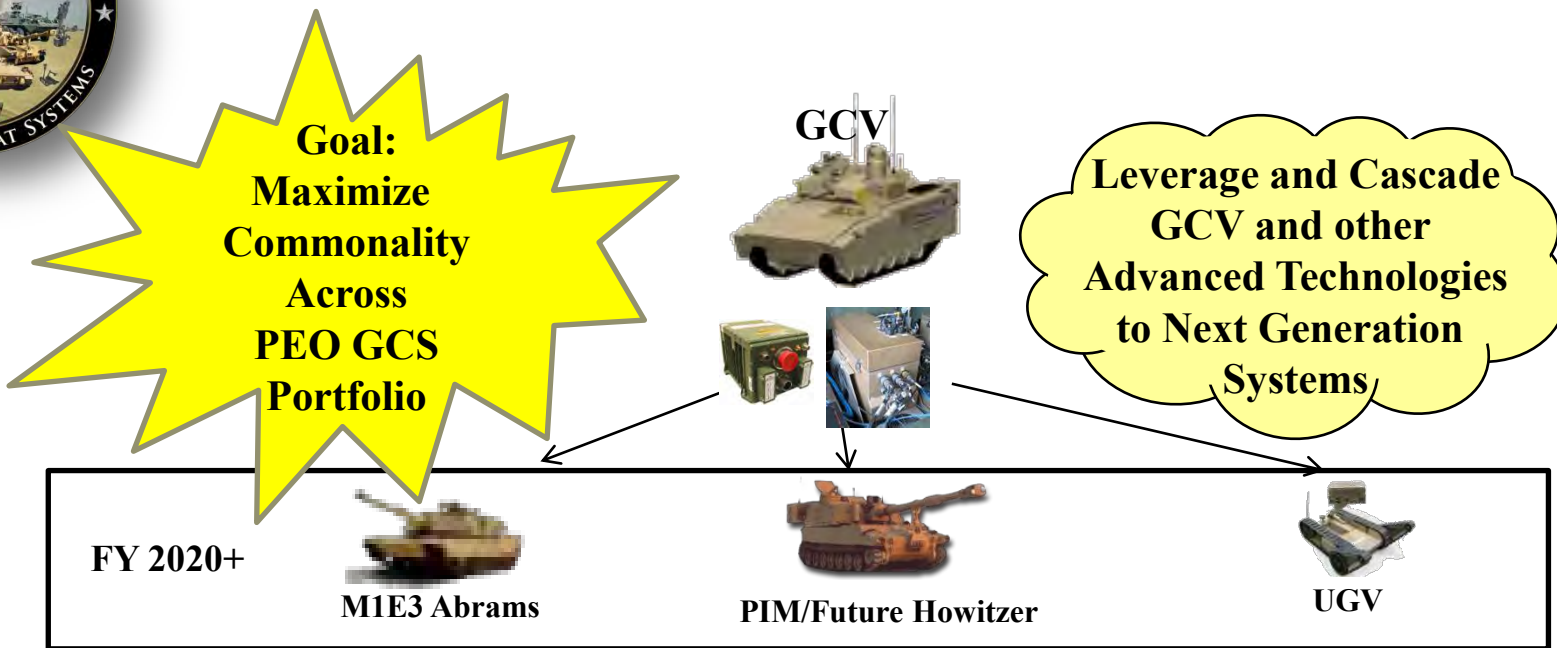
- Capability-centric: Authoritative brigade architectures define current/future capabilities
- Utilize system engineering approach to allocate technical requirements from brigade, to platforms, to subsystems
- Common embedded vehicle computing standards and solutions
- Less boxes and duplicity
- Induced environments
- Coherent enterprise architecture across the Network founded on standards-based COE
- Leverage commercial components & reduce SWaP-C (plug & play/easier upgrades)

Systems Integrated By Design, Tested Together, and Fielded as a Package

OUR MISSION IS OUR WARFIGHTERS' FUTURE



Commonality



Strategy

- Establish PEO GCS Enterprise-wide commonality
- Develop and mandate foundational products (e.g. Common Operating Environment, common embedded computing standards, etc...)
- Standardize architectures and interfaces (Plug & Play)
- Utilize SOS engineering to decompose and analyze requirements, produce common architecture specifications, and generate supporting business case analysis
- Collaborate with partners across DoD and industry

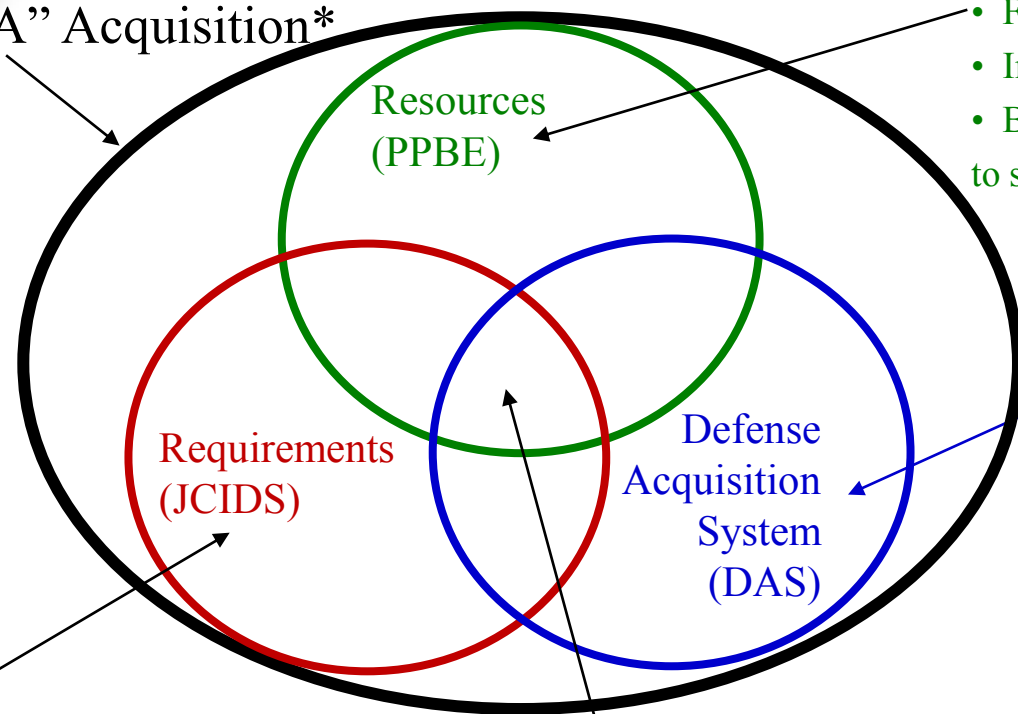
OUR MISSION IS OUR WARFIGHTERS' FUTURE



Systemic Issues of Big “A” Acquisition

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

Big “A” Acquisition*



- Funding instability
- Insufficient resource trade space
- Budget not properly phased/magnitude to support planned development

Small “a” Acquisition

- Immature technologies
- Inadequate systems engineering
- Inadequate requirements flow-down/ traceability/ decomposition
- Insufficient schedule trade space
- Inadequate implementation of Earned Value Management System
- Lack of time and assets for testing

- Lack of JROC-validated requirements document for basic program (ORD, CDD, CPD)
- Inadequate requirements for basic program and any increments
- Critical dependence on external programs with developmental issues

- Lack of inter- and intra-departmental stakeholder coordination and support

Joint Capabilities Integration and Development System (CJCSI-3170)
Program, Planning, Budgeting, and Execution (DoD-7000, FMRs)
Defense Acquisition System (DoDI-5000)

*Systemic Issues of Nunn-McCurdy “Class of 2007” Programs

Synchronize JCIDS, DAS, and PPBE to deliver capabilities to Warfighters.

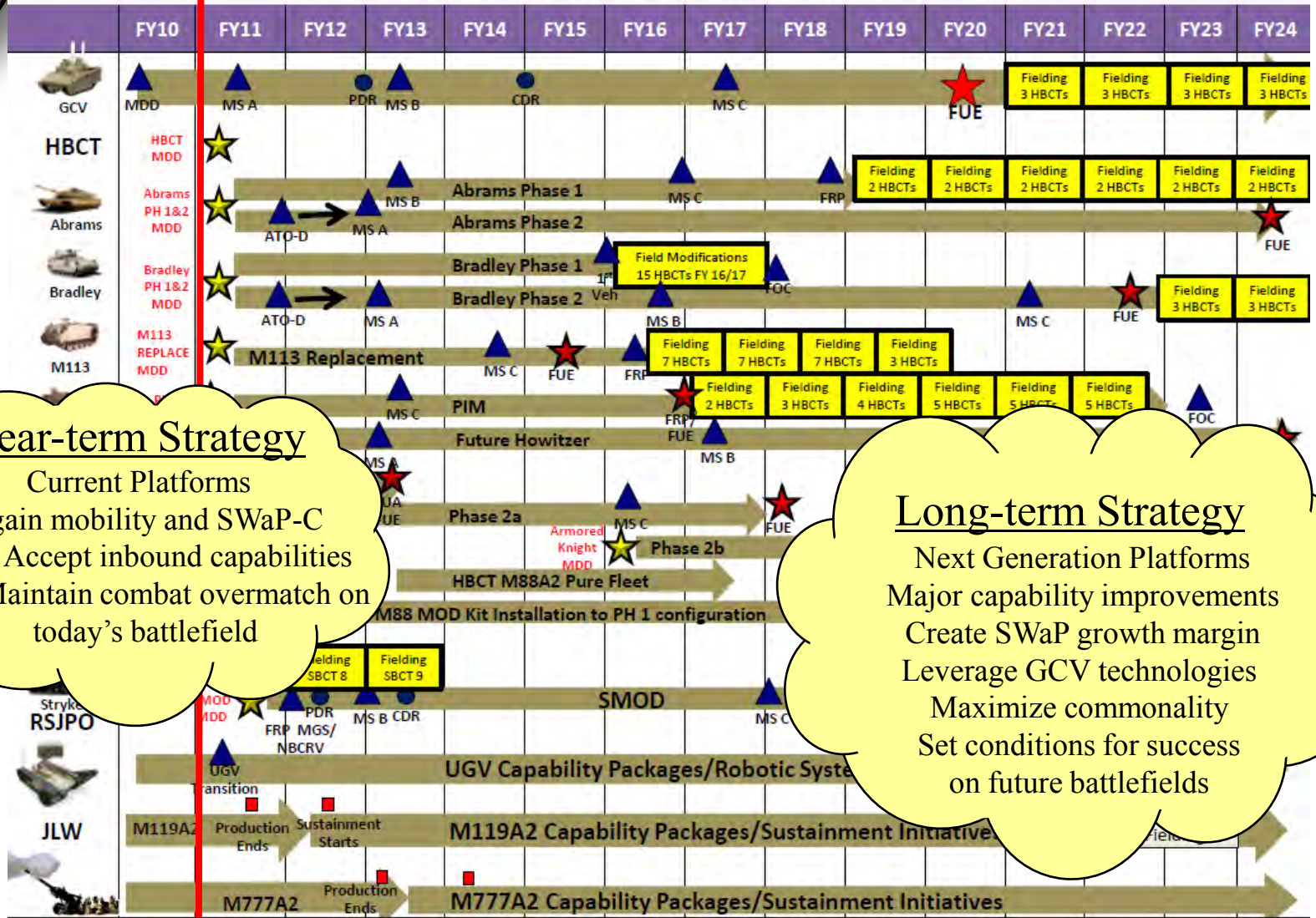


Where We Are Heading

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

Time Now

PEO GCS Notional Modernization Schedule



Near-term Strategy

Current Platforms
Regain mobility and SWaP-C
Accept inbound capabilities
Maintain combat overmatch on today's battlefield

Long-term Strategy

Next Generation Platforms
Major capability improvements
Create SWaP growth margin
Leverage GCV technologies
Maximize commonality
Set conditions for success on future battlefields

OUR MISSION IS OUR WARFIGHTERS' FUTURE



Shaping the Way Ahead

2010 Army Modernization Strategy



2010 Combat Vehicle Capability Portfolio Review

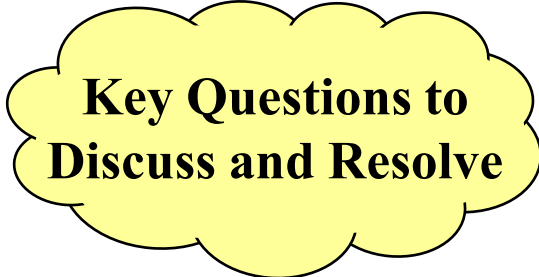
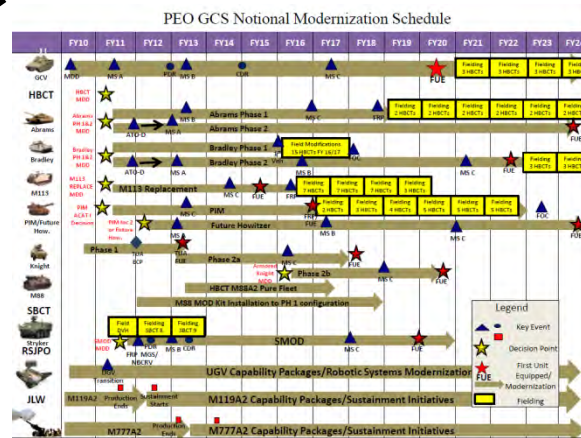
AMERICA'S ARMY: THE STRENGTH OF THE NATION Near-Term Investment Strategy

	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17
OPS GCS (Excluded Items)	OFF	OFF	OFF					
GCV FY 11-13 \$2.5B (Requirements)	▲	▲	▲				★	▲
Abraams FY 11-13 \$1.5B (Requirements)		★	▲	▲				
Bradley FY 11-13 \$1.4B (Requirements)		★	▲	▲				
M113 FY 11-13 \$1.1B (Requirements)		★	▲	▲				
Paladin FY 11-13 \$1.1B (Requirements)		★	▲	▲				
PMM FY 11-13 \$1.1B (Requirements)		★	▲	▲				

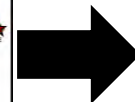
Legend: ▲ Start, ★ Key Event, ▲ Decision Point, ▲ First Unit Equipped/Maintenance, ▲ Holding



PEO GCS Modernization Campaign Plan



What are the next steps with Requirements? Funding? Programs? Milestone Decisions?



Together, with a Coordinated Plan, we can Secure the Decisions and Resources Necessary to Ensure an Affordable, Robust Ground Combat System Portfolio

OUR MISSION IS OUR WARFIGHTERS' FUTURE

**PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS**



OUR MISSION IS OUR WARFIGHTERS' FUTURE



**PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS**



PM Heavy Brigade Combat Team (HBCT)

**William Sheehy
Colonel, IN
Project Manager**

OUR MISSION IS OUR WARFIGHTERS' FUTURE



Heavy Brigade Combat Team

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS



Heavy Brigade Combat Team

PM COL W. Sheehy
DPM Mr. K. Houser



Stryker Brigade Combat Team

PM COL R. Schumitz
DPM Ms. C. Tucker



Lightweight 155MM Howitzer

PM (Acting) Mr. K. Gooding
DPM (Acting) Mr. Chris Hatch



Robotic Systems JPO

PM LTC D. Thompson (USMC)
DPM Mr. J. Jaczkowski

PM Abrams



PM Bradley



PM Fire Support Platforms



PD Mounted Maneuver Support



PD Mounted Maneuver Foreign Military Sales



OUR MISSION IS OUR WARFIGHTERS' FUTURE



Priorities

Heavy Brigade Combat Team

- Support the Fight
- Modernize the Formation
- RESET the Fleet



PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

OUR MISSION IS OUR WARFIGHTERS' FUTURE



Current Status

- **Average Fleet Age:**
 - Abrams → 2 years
 - Bradley → 3 years
 - Paladin → 11 years
- **PIM is on Schedule**
- **Close to a Decision on:**
 - M113 Replacement
 - Tank & Bradley Improvements



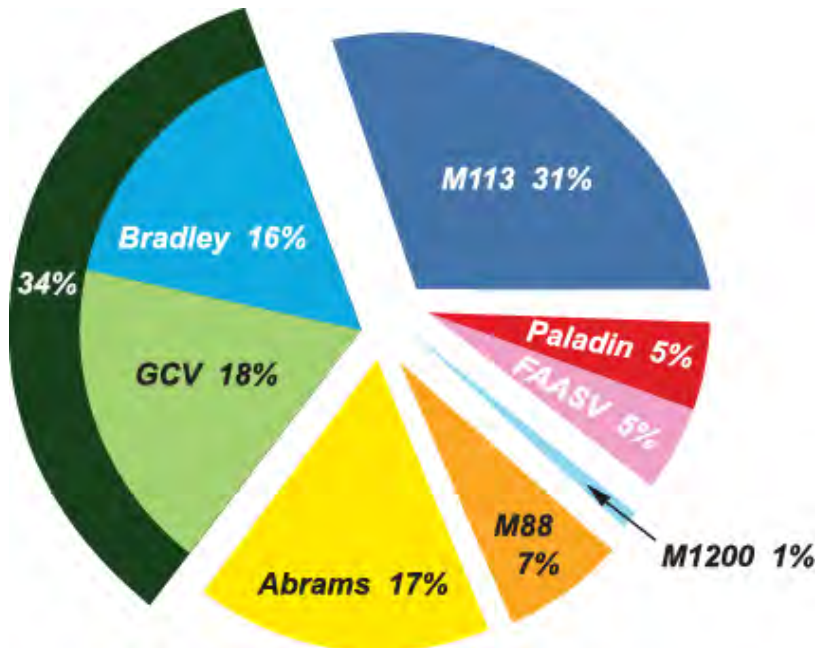
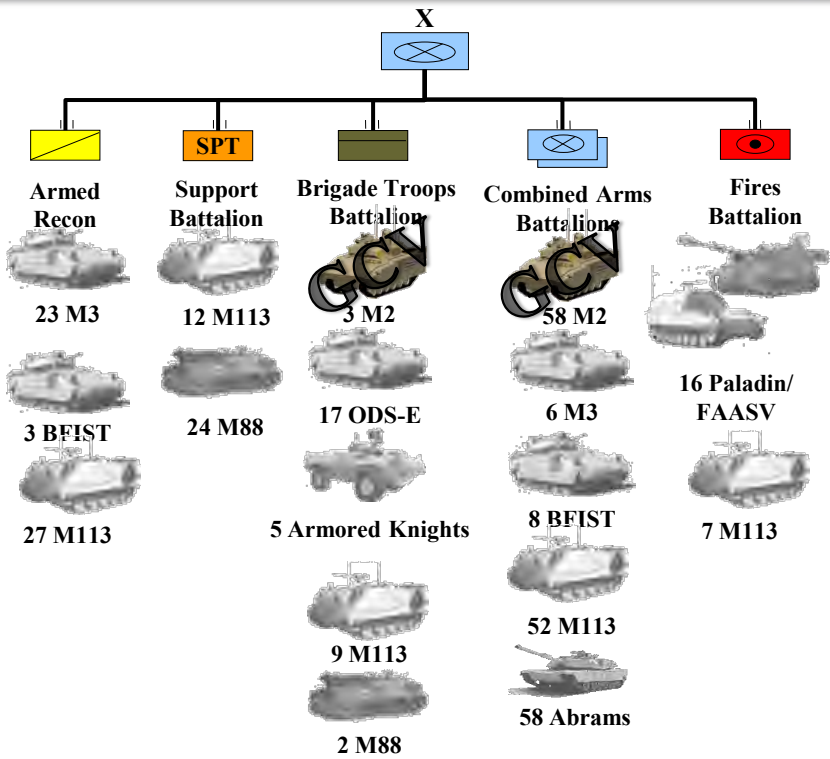
Heavy Brigade Combat Team

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

Ground Combat Vehicle (GCV) replaces 61 of 346 vehicles in the HBCT Formation

As a Formation the HBCT Must:

- Maneuver in the same environment
- Fight against the same threat
- Be sustained under the same logistics footprint
- Interoperate on the same network



GCV is the modernization plan for HBCT, therefore, we must prepare the formation to fight as a combined arms team by addressing HBCT capability gaps across the formation

OUR MISSION IS OUR WARFIGHTERS' FUTURE



How to Modernize Single Formation Concept

A two phased holistic modernization strategy that allows the entire Heavy Brigade Combat Team to defeat the same threat, interoperate in a common environment, under the same logistics footprint, and on the same network

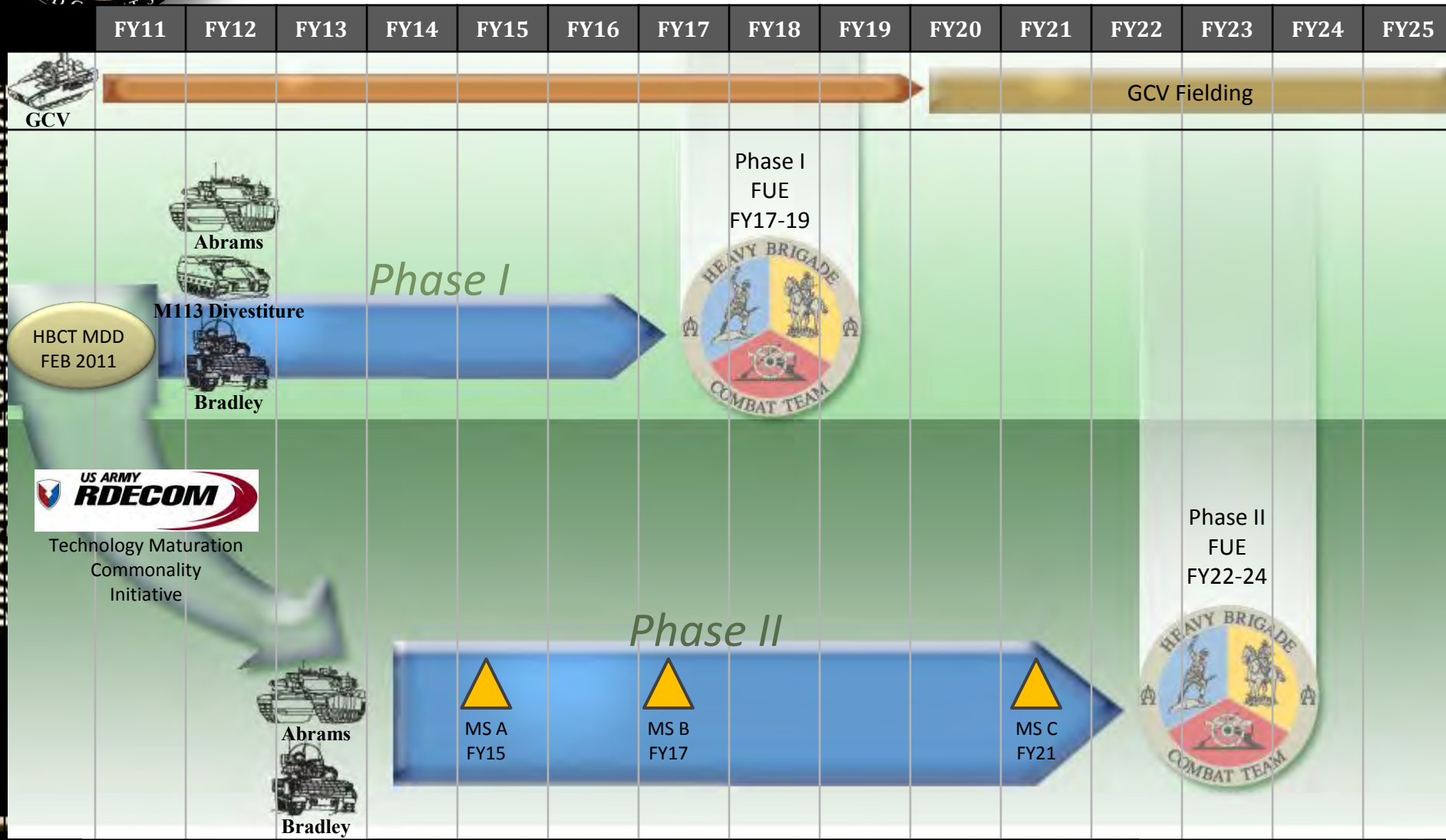
- **Phase I: Current Fleet (2011-2017)**
 - Allows Army to add critical capabilities projected for the current fleet
 - Maintains combat overmatch on today's battlefield
 - Limited modifications to hull and turret structure
 - M113 Divestiture 80% complete by FY16
 - Leverages existing Industry/Depot/PM relationships
- **Phase II: Next Capability Sets (2011-2024)**
 - Modernize the entire HBCT fleet as a Single Formation
 - Major improvements against capability gaps defined by platform CDDs
 - Create SWaP margin to meet unknowns of future battlefield
 - Leverage GCV technologies
 - Maximize commonality across the formation
 - Sets the conditions for continuing success on future battlefields
 - Full and open competition

Phase I and Phase II begin Simultaneously; Deliver Incrementally

OUR MISSION IS OUR WARFIGHTERS' FUTURE



Single Formation Concept





Issues/Concerns

- **Maintain combat overmatch**
- **Current fleet interoperability with GCV**
- **Create SWaP margin**
- **Protection of the industrial base**

**PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS**



OUR MISSION IS OUR WARFIGHTERS' FUTURE



**PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS**



PM Stryker Brigade Combat Team (SBCT)

**LTC Schirmer
Lieutenant Colonel, AR
Product Manager**

OUR MISSION IS OUR WARFIGHTERS' FUTURE



Stryker Family of Vehicles

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS



M1126
Infantry Carrier Vehicle (ICV) - 130



M1127
Reconnaissance Vehicle (RV) - 52



M1128
Mobile Gun System (MGS) - 29



M1129
120mm Mounted Mortar Carrier (MCV) - 37



M1135
NBC Reconnaissance Vehicle (NBCRV) - 3

Commonality

- Common Operating Picture
- Common Chassis & Drive Train
- Common KPP's
- Common Survivability
- Common TMDE, Spare Parts, Tools & Skills

Bottom Line

Stryker provides enhanced, battle-proven capabilities to warfighters
Over 27 million miles in Combat
Currently on 14th SBCT Deployment



M1130
Commander's Vehicle (CV) - 28



M1134
Anti Tank Guided Missile (ATGM) - 10



M1133
Medical Evacuation Vehicle (MEV) - 16



M1132
Engineer Squad Vehicle (ESV) - 13



M1131
Fire Support Vehicle (FSV) - 14

Total in a Brigade: 332

Current Fleet Delivered: 3,458

Remaining On Order: 567

OUR MISSION IS OUR WARFIGHTERS' FUTURE



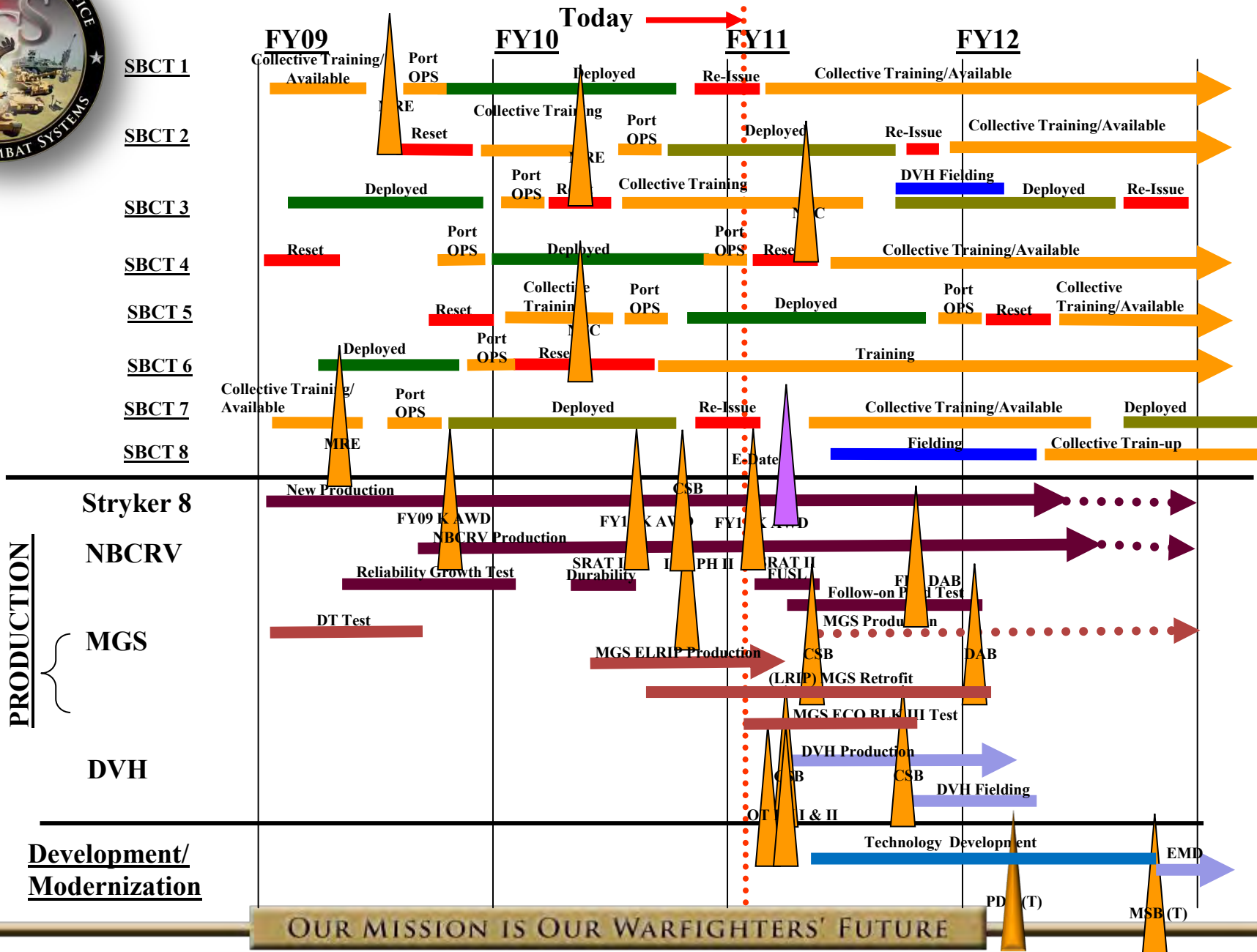
Stryker Opportunities for Industry and Challenges

- **Industry Potential:**
 - GDLS Supplier/Sub-Contractor
 - Weight Reduction/Saving Alternatives
 - Production of A-kits (mounting/attachment hardware) for DVH kits
 - Survivability kit refurbishment (e.g., platt swing mounts)
 - Packaging for selected assemblies (e.g., suspension items)
- **Communications and Net Readiness:**
- **C2 Technologies, Smart Display Commonality, Modular Intra –Vehicle Network**
 - Situational Awareness: Out of Hatch capabilities, Video recording, 360 SA
- **Integrate C4ISR Systems into Stryker Platforms- Technology Capability Integration Solutions**
 - Compliance with Net-centric Operations and Warfare Standards
 - IDE (Integrated Digital Environment) -
 - **The IDE is an integral part of Stryker becoming part of the Army Net-Centric Data enterprise. IDE will be implemented using ANCDS technologies and architectures.**
 - Robust Network Capability (voice – data – video) enabling communications for line of sight or beyond line of sight
 - Execute Tactical Network Operations to expand and extend transport network based on operational needs
- **Supportability:**
 - Continuous/cost-saving Improvement to support the FOV



Stryker Fielding & Program Schedule

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS





The Need to Modernize

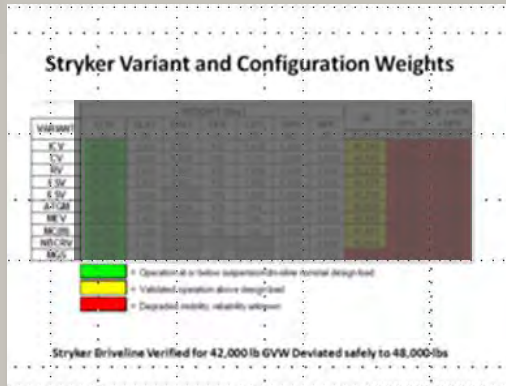
PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

SPACE



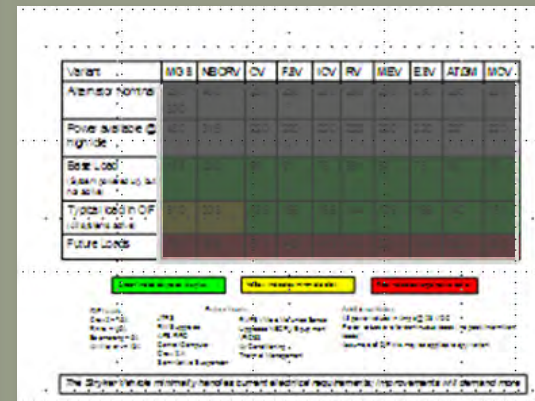
- Multiple Appliqué solutions added; “Scaleable / Kitable Concept” limited
- Kits create both interior & exterior challenges for each carrier variant
 - CREW, GSS/MSS, Armor Upgrades
 - Additional displays/screens
 - 2nd/3rd order effects include weight and power

WEIGHT



- Kits required to address threats
 - IED, RPG, EFP, Sniper, etc
- Only select Kits can be applied
- Deployed configuration weighs more than planned
- Limit Mobility

POWER



- OIF kit loads require some systems to be turned off
- Current Power Generation cannot meet expected future loads
- Silent watch capability impacted
- Excess heat impacts both onboard electronics and Soldier’s effectiveness

Current Space, Weight, and Power Capacity Shortfalls require Upgrades to Stryker FoV

OUR MISSION IS OUR WARFIGHTERS' FUTURE

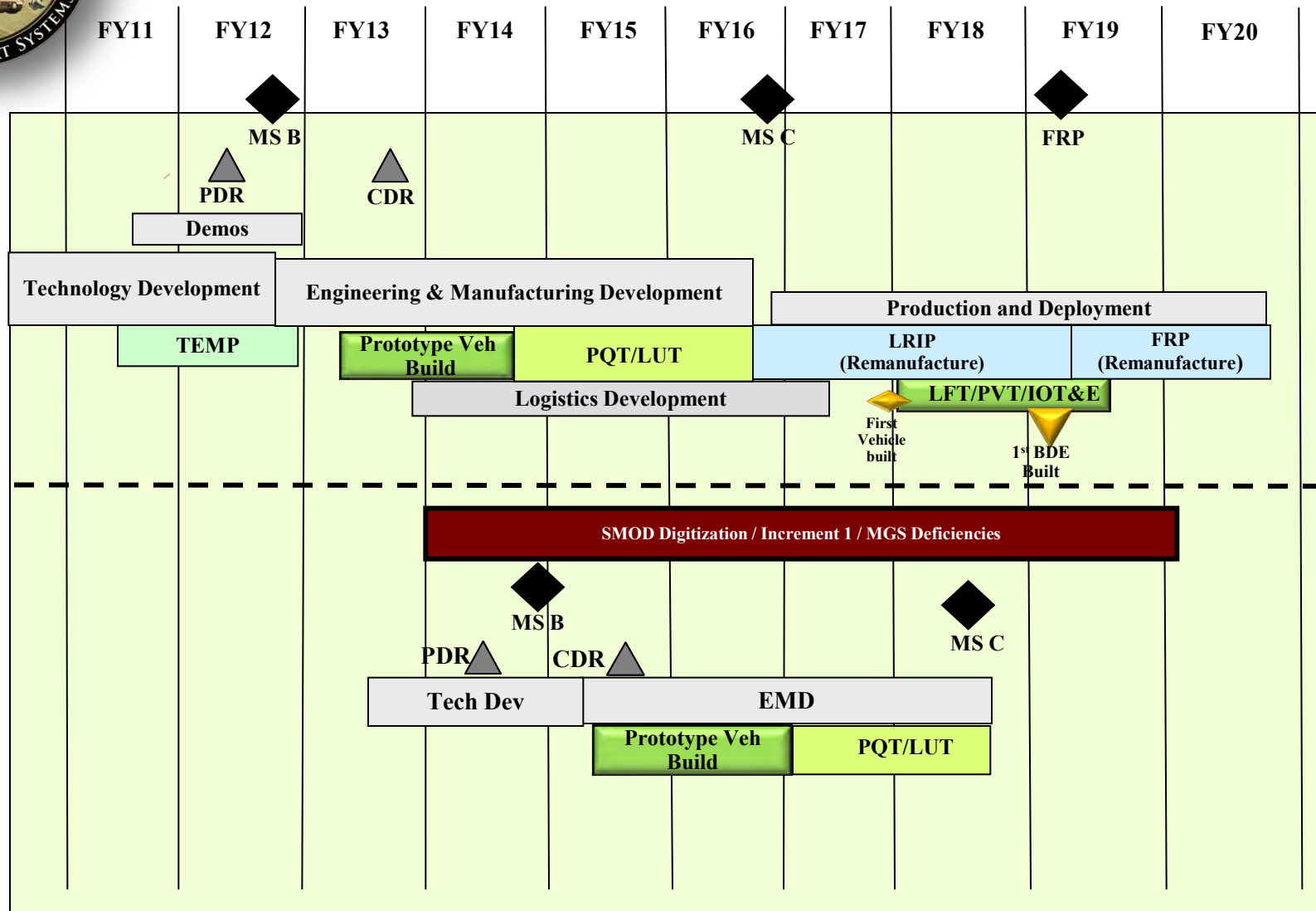


A Notional Upgrade/Modernization COA

Increment I MS C in FY 16

Increment II MS C in FY18

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS



OUR MISSION IS OUR WARFIGHTERS' FUTURE



Inputs Driving Modernization

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

Address capability gaps identified in CNA and other analysis

Remaining interoperable at the Joint level

Evolution of Threat devices & TTP

Current Fight Upgrades

Cap Packages /Spiral Technologies

Improving Crew efficiency and effectiveness

Increased Weight growth

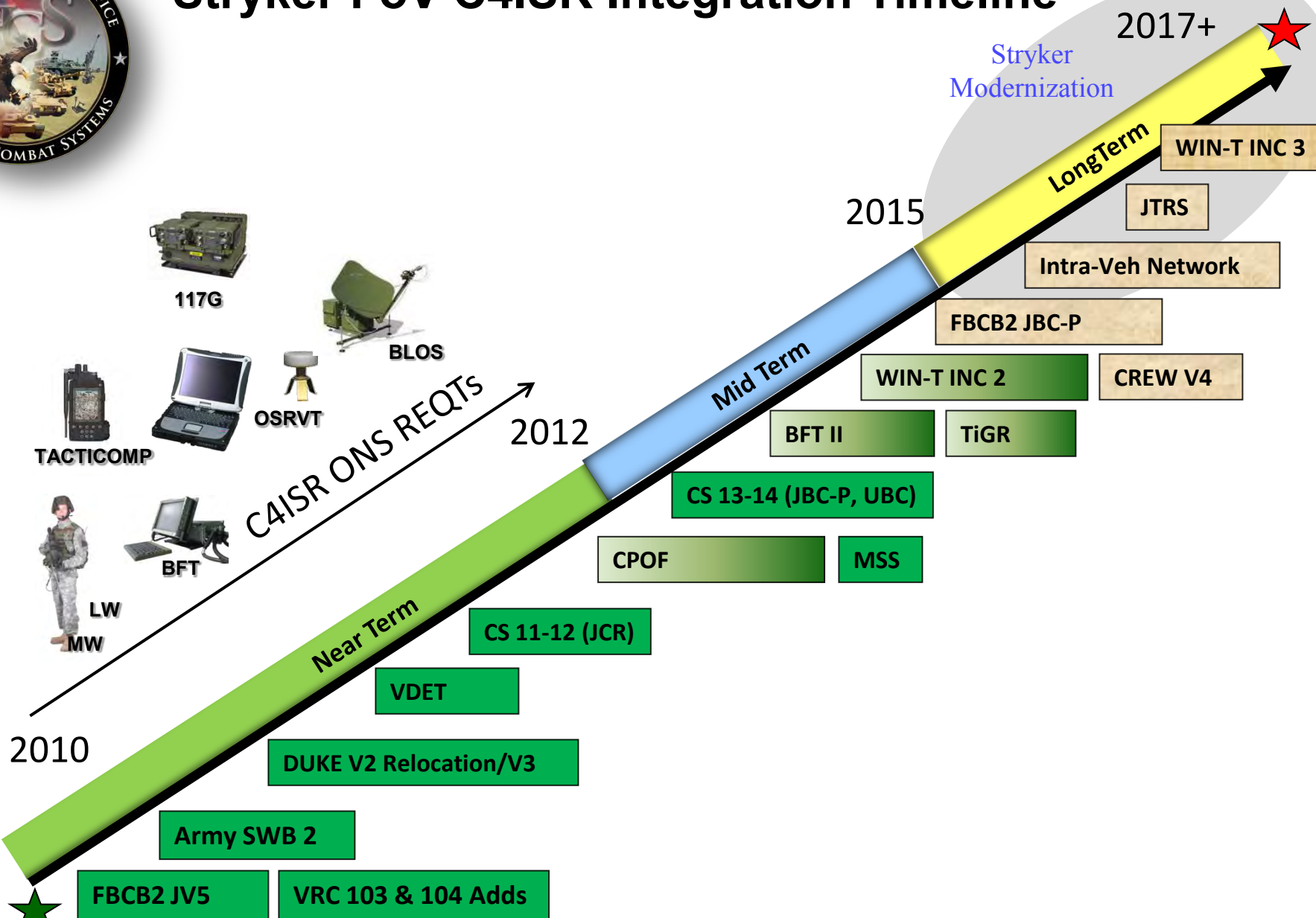
Current & projected increases in Power Consumption

OUR MISSION IS OUR WARFIGHTERS' FUTURE



Stryker FoV C4ISR Integration Timeline

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS



OUR MISSION IS OUR WARFIGHTERS' FUTURE

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

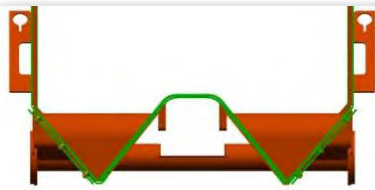


Stryker Modernization Plan (Core Enablers)

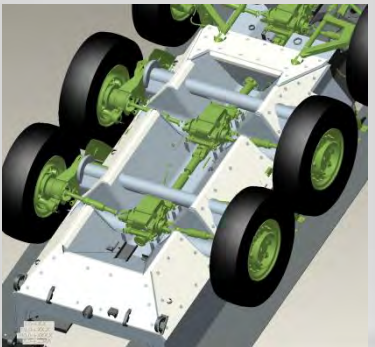
PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

Chassis

- 60k lbs rated suspension (Semi-active)
- Larger tire (Increased mobility)
- Axle spacing changes requires modified lower hull
- Survivability improvement with double V hull
- Mine Blast Seats / Restowage



Double V Hull Concept



DVH (TPE)

- 5.5 Driveline
- Reinforced tires

Re-capitalization / Re-Use

Common with DVH

- 450 HP Engine
- Larger Cooling Module
- Combined Heating & Air Conditioning
- High Voltage & 28V Power Distribution Bus
- Increased Power Generation (High Voltage)

Time Capability Phased Program?

Digitization (Chassis Common)

Data/Video Networks (Ethernet & CAN)

- Multifunction common displays
- Supports integration of JTRS and WIN T
- Supports future 360 SA & Sniper detection integration
- Single point software downloader

Embedded FBCB2/BFT

Battery and Power Mgt

Digital drivers display

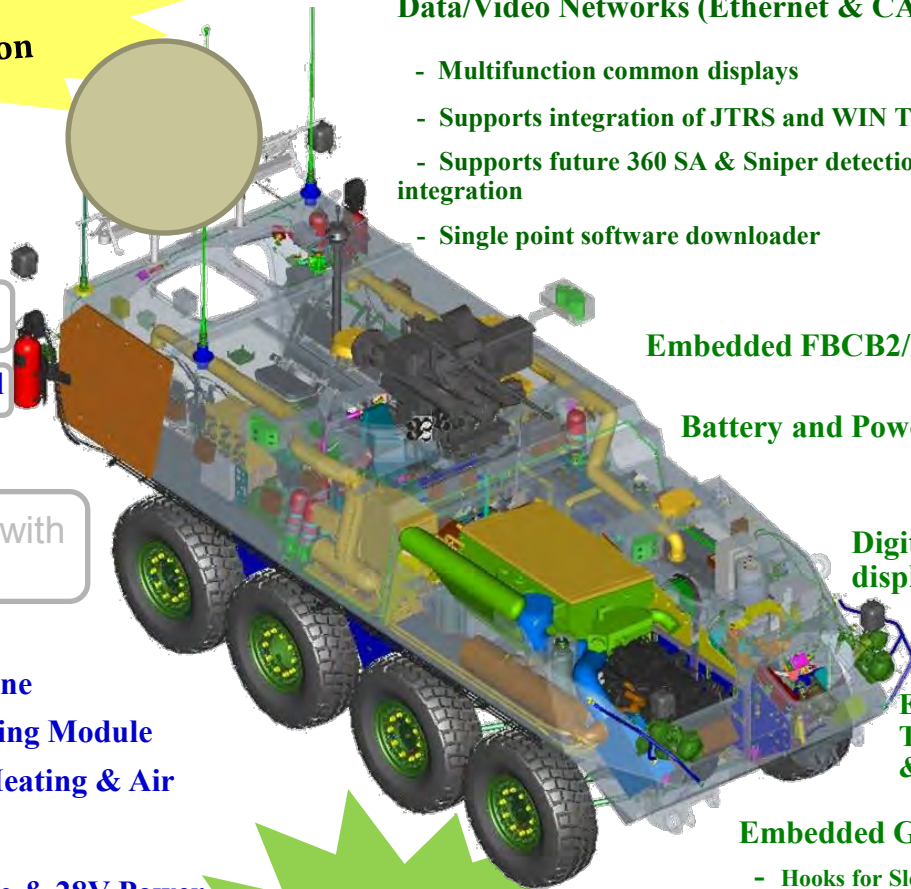
Embedded Training & External Port

Embedded GPS and INS

- Hooks for Slew-to-cue and Far target location

Condition Base Maintenance

- Embedded Diagnostics
- Portable Maintenance Aid



- All components TRL >6
- Challenge: Packaging and Integration

OUR MISSION IS OUR WARFIGHTERS' FUTURE


**PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS**



Advanced Artillery for the 21st Century



OUR MISSION IS OUR WARFIGHTERS' FUTURE



LW155 JPMO

9 November 2010

Mr. Keith Gooding

JPM, LW155

973-724-4427

keith.t.gooding@us.army.mil



JPMO-LW155 - About Us

- **Located at Picatinny Arsenal, NJ**
 - Co-located with ARDEC and PEO-Ammo
- **JOINT Program Manager – Keith Gooding**
 - Key staff a mix of PEO-GCS, PEO-LS and ARDEC
- **Manages ALL towed artillery for the Army**
- **Manages M777A2 for the USMC**



JPMO-LW155 - Portfolio

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS



M777A2



M198



M119A2&E1



D30



Gun Laying and Positioning System (GLPS)



M111&E1 Improved Position and Azimuth Determining System (IPADS)

Projected End State Total (AAO):

M777A2:	394 Army / 511 USMC
M198:	741 (Production Complete)
M119:	823 (441 New Production)
D30:	184 Afghan Army
GLPS:	458 (Production Complete)
IPADS:	278 Army / 63 USMC

ON IS OUR WARFIGHTERS' FUTURE



M777A2 Howitzer

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

System Description

- 155mm Towed Howitzer
- Joint US Army/USMC Program
- AAO US Army 394 and USMC 511
- FMS to Canada (37) and Australia (35)
- BAE Systems (UK) is Prime Contractor for Production and Sustainment
- GFE Cannon and Optical Fire Control

Key Requirements/Performance

- Weight < 10,000 lbs
- Emplacement < 3 Minutes
- Displacement < 2-3 Minutes
- Rate of Fire > 4 rounds per Minute
- Compatible with Excalibur and PGK

Production/Sustainment Schedule

- Army/USMC Production through 2012
- Additional Production Likely
 - Additional Army weapons
 - Significant Additional FMS interest
- Sole source ICS sustainment contract extended through Feb 2012
 - 1 Year Extension Likely
- Competitive PBL contract in FY13

Modernization Strategy

- Lethality
 - Diode Pumped Laser Ignition System (FY13)
 - Hydraulic Power Assist Kit (FY11)
 - Electronic Thermal Warning Device FY12)
- Networked Battle Command
 - Digital Fire Control Refresh (FY14)
- **Competitive procurement strategy anticipated in all save HyPAK (under contract)**

OUR MISSION IS OUR WARFIGHTERS' FUTURE



M119A2 Howitzer

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

System Description

- 105mm Legacy Howitzer
- 382 M119A2 howitzers in Inventory
- Production Line Re-started at Joint Manufacturing and Technology Center (Rock Island) in 2005
- 441 M119A2 howitzers
 - » 250 fielded

Key Requirements/Performance

- Provides direct support fires for IBCT
- Weight < 4,500 lbs
- Air Transportable by UH60
- Compatible with PGK

Production/Sustainment Schedule

- JMTC Production set to conclude in 1QFY12
- Reset of fielded M119A2 weapons at Anniston Army Depot (AAD) through 2017
- Competitive Inertial Navigation System contract awarded in FY10
- Competitive Muzzle Velocity Sensor System contract awarded in FY10

Modernization Strategy

- Networked Battle Command
 - Develop Digital Fire Control System (DFCS) Upgrade
 - Competitive procurement in FY11
- Other
 - Convert all fielded howitzers to A3 Configuration via field mod

OUR MISSION IS OUR WARFIGHTERS' FUTURE



M111 IPADS

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

System Description

- Self-contained surveying system capable of determining position, altitude and azimuth
- AAO US Army 278 and USMC 63
- L-3 Communication Prime Contractor
- IPADS-G = IPADS + embedded SAASM receiver

Key Requirements/Performance

- Zero Velocity Update ~20 Minutes
- Survey Area – 100 Km (radius)
- Optical Transfer – 32 Meters

Production/Sustainment Schedule

- IPADS Production and Fielding complete
- IPADS-G Entering Production NOW
 - First Article Testing 2-3Q FY12
 - Initial Production Deliveries 1Q FY12
 - First Unit Equipped 2QFY12
 - FMS interest

Modernization Strategy

- Networked Battle Command
 - Embedded GPS in IPADS-G
 - Control and Display Upgrade

OUR MISSION IS OUR WARFIGHTERS' FUTURE



Legacy Systems

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

System Description

- JPMO Manages 3 Legacy Systems
- Principally sustainment activities
- No direct Industry opportunities with JPMO
- Limited Industry Opportunities through subcontracting

Key Requirements/Performance

120 each M198 155mm w/ ASL/BII and other equipment
4 cases

Case 1 and 2 = 54 / 66 guns AS IS = 120 guns
Excess Defense Articles (EDA) Grant
Transfer

Case 3 IQ-B-UDC – 54 guns rebuilt @ RIA
Case 4 GX-B-ZAB – 66 guns rebuilt @ RIA
Effort to occur through FY11 and Fy12

Production/Sustainment Schedule

- JPMO to field 204 D-30 Soviet Howitzers to Afghanistan National Army in by COB CY11
 - 80 to be refurbished in Afghanistan
 - 44 to be refurbished in Ukraine
 - General Dynamics contracted to oversee effort
 - 60+ Donated by Bosnia/Herzegovina
 - Will be refurbished in country by local contractor (likely sole source)

Modernization Strategy

- 1st Gen autonomous positioning and directional system
- Determines azimuth/deflection and position coordinates.
- Production Complete
 - AAO – 368
 - On Hand – 458

OUR MISSION IS OUR WARFIGHTERS' FUTURE



Summary

- **M777A2 and M119A2 both undergoing significant modernization efforts**
 - Competitive Opportunities for Industry
- **IPADS-G modernization effort underway**
 - Limited Opportunities for Industry
- **JPMO-LW155 legacy systems are in sustainment/draw down**
 - Limited opportunities for Industry

Lightweight 155mm Towed Howitzer Portfolio



M777A2



M198



M119A2&E1



D30



Gun Laying and Positioning System (GLPS)



M111&E1 Improved Position and Azimuth Determining System (IPADS)

Projected End State Total (AAO):

M777A2:	394 Army / 511 USMC
M198:	741 (Production Complete)
M119:	823 (441 New Production)
D30:	184 Afghan Army
GLPS:	458 (Production Complete)
IPADS:	278 Army / 63 USMC

The Future of Towed Cannon Artillery



**PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS**



OUR MISSION IS OUR WARFIGHTERS' FUTURE



BRIEF TO COMBAT VEHICLE CONFERENCE

LtCol David Thompson, Project Manager



9 November 2010

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

Evolution of Ground Robotics in Combat

- Sustainment, Modernization, Interoperability and Modularity

2004

162 systems

- No single vendor could produce 162
- 5 vendors, multiple configurations
- Joint effort, EOD focused

2005

1800 systems

- Robot's proven ability to save lives
- Expansion beyond EOD mission (Countermine, Security)
- Agreements w/ AMC and REF

2006

4000 systems

- Engineers and Infantry
- Route clearance, Explosive detection & Weaponization development

2007

5000 systems

- Special Forces robot applications assessed
- Route clearance, Explosive detection & Weaponization on battlefield

2008

6000 systems

- Maneuver elements
- Range extension
- CBRNE detection
- Persistent surveillance
- RC HMMWV
- More capable payloads

2009-2010

7000 systems

- Smaller platforms
- Enhanced battery life
- Enhanced commonality
- Remote deploy
- More capable payloads

Future

- Interoperability
- 'Plug & play' capabilities
- Limited autonomy
- Weaponization
- Increased agility and dexterity

Current Operations

- Robotic systems have functioned properly and reliably during OIF/OEF
- RS JPO has fielded over 7000 ground robotic systems since 2004
- Warfighters are generally satisfied with current UGVs, but priorities are improvements in size, weight, and power consumption
- What the Soldier wants:
 - More autonomy to reduce workload
 - Extended standoff ranges
 - Common controller
 - Increased endurance
 - Increased dexterity & agility
 - More capable/compact payloads
 - » Cameras, comms, IED detection, etc
 - MORE systems!





Modularity

ROBOTIC SYSTEMS JPO

Common Within Platforms

Common Across Platforms

Mission Specific Payload

Power Supply

Actuator

Navigational Sensors

Mobility Platform

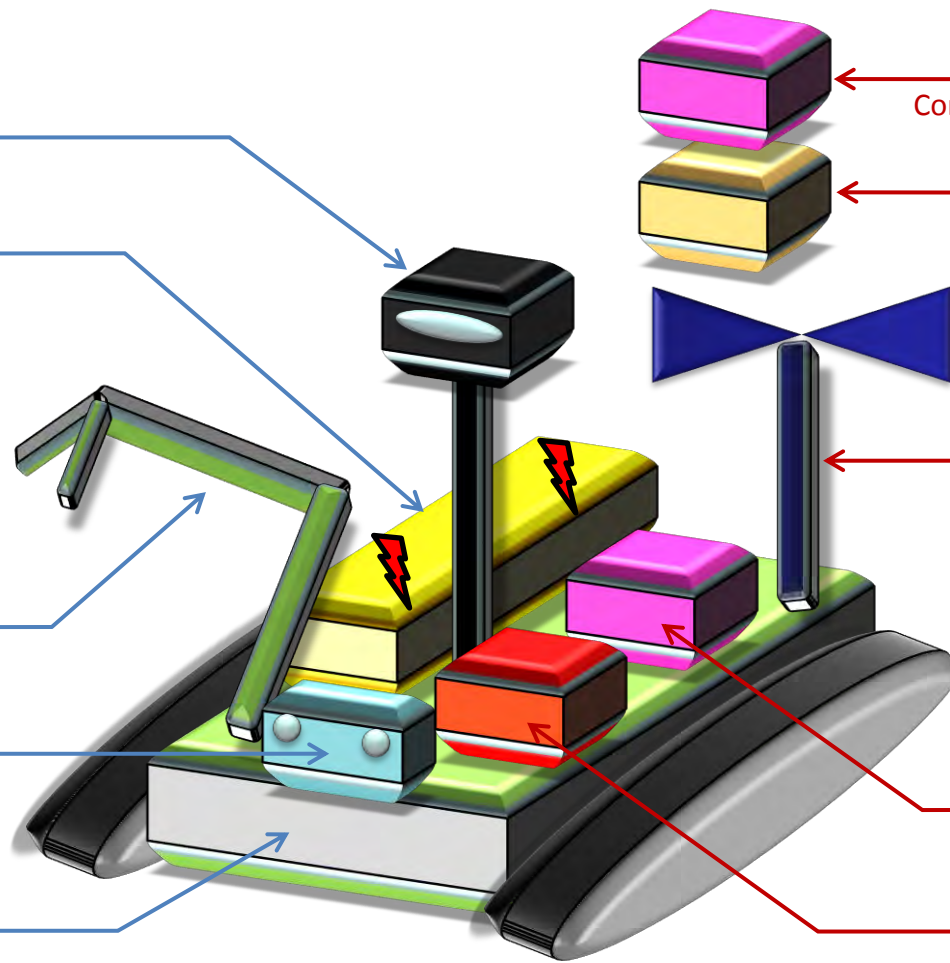
Common Integrating Software

Common Controller

Communications

Operating Software

Artificial Intelligence


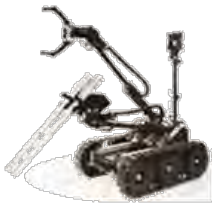










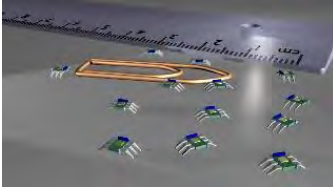





Ground Robotics Capability Sets

Photos for CDDs and Efforts are Notional Representations



ROBOTIC SYSTEMS JPO

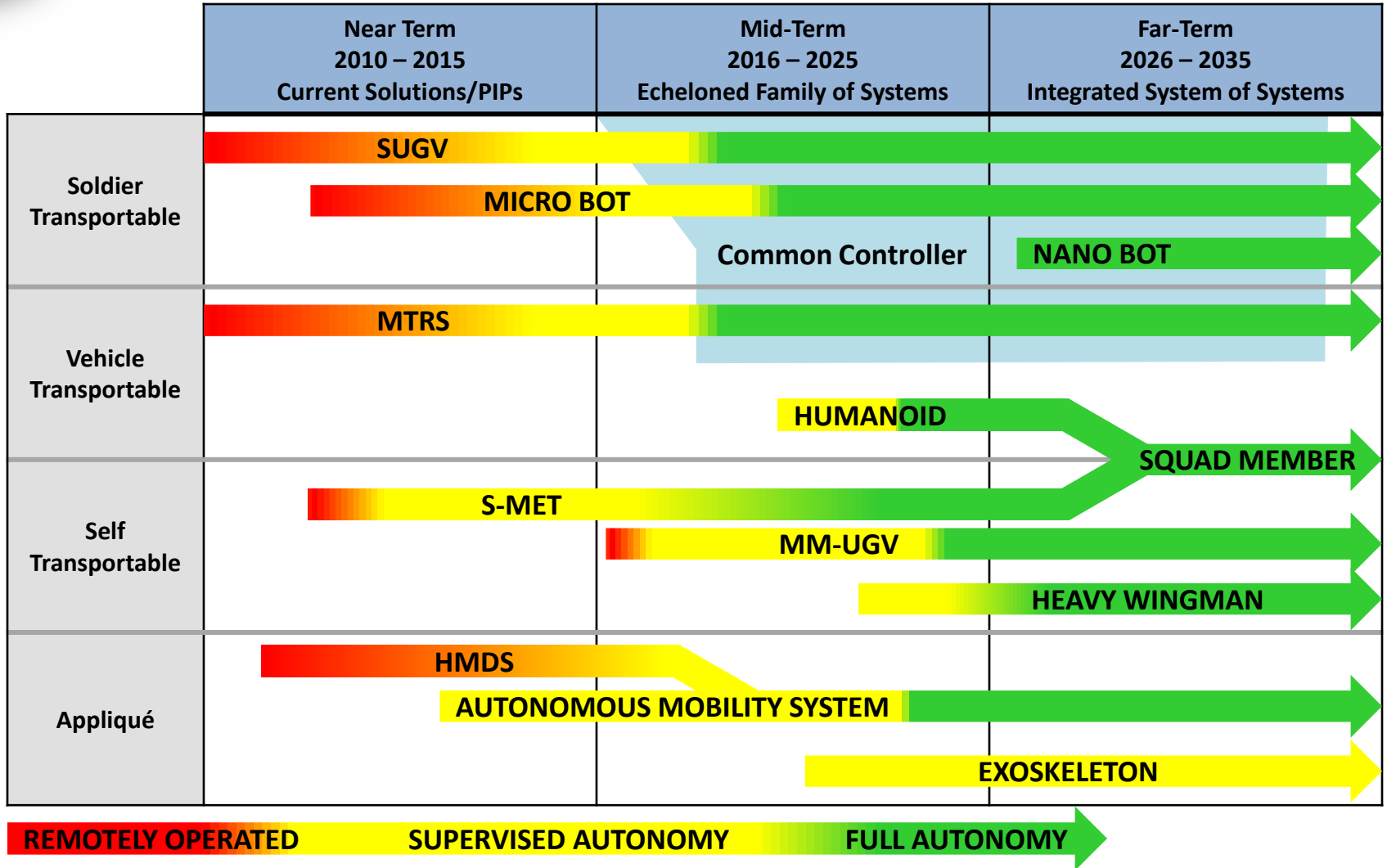
Soldier Transportable	Vehicle Transportable	Self Transportable	Appliqué
<p>Crew Served Bot</p> 	<p>Mounted or Towed</p> <p>Man Transportable Robot System (MTRS) POR</p> 	<p>Soldier Follower – IBCT</p>  <p>Squad Mission Equipment Transport (SMET) CDD</p>	<p>Remote Operation</p>  <p>Husky Mounted Detection System (HMDS) POR</p>
<p>Small Bot</p> <p>Small Unmanned Ground Vehicle (SUGV) CDD</p> 		<p>Medium Wingman – SBCT</p>  <p>Multi-Mission Unmanned Ground Vehicle (MM-UGV) CDD</p>	<p>Supervised Autonomy</p>  <p>Convoy Active Safety Technology (CAST) CDD</p>
<p>Micro Bot</p> 	<p>Armed</p> 	<p>Heavy Wingman – HBCT</p> 	<p>Full Autonomy</p>  <p>Combat Autonomous Mobility System (CAMS) JCTD</p>
<p>Nano Bot</p> 	<p>Humanoid</p> <p>Battlefield Extraction Assist Robot (BEAR) Initiative</p> 	<p>Squad Member</p> 	<p>Exoskeleton</p> <p>Exoskeleton (XOS) CDD</p> 

Army UGV Capability Timeline

Supported by the UGV Campaign Plan



ROBOTIC SYSTEMS JPO



Opportunities for Industry

- Interoperability Initiative
 - » Working Integrated Product Team Conference 16-17 November 2010
 - » Modular payloads
 - » Open architecture standards development

- Source Sought Notice on FedBizOpps
 - » Solicitation Number: W56HZV11JLB01
 - » Approximately 80-100 Full Time Equivalents in support of RSJPO global mission
 - » Responses due 17 Nov 2010

- Emerging requirements
 - » Move from tele-op to semi-autonomy
 - » Reducing the Soldier's and Marine's load
 - » Non-lethal and lethal projection
 - » Power management
 - » Second sourcing of spares/components



PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS



Panel



Discussion



OUR MISSION IS OUR WARFIGHTERS' FUTURE



HBCT

COL W. Sheehy
bill.sheehy@us.army.mil

RS JPO

LtCol D. Thompson (USMC)
david.c.thompson6@us.army.mil

SBCT

COL R. Schumitz
robert.w.schumitz@us.army.mil

LW 155

Mr. K. Gooding
keith.t.gooding@us.army.mil



2d Light Armored Reconnaissance Battalion



Company C

May – November 2009

Capt Christopher Conner



Orientation





Orientation



- Original mission was to seize Khan Neshin, establish GIRoA, and bring security to the area.
- Battlespace of over 14,000 square kilometers.
- Initially seized the District Capital, Khan Neshin Castle.
- Created FOB Payne, and then many smaller COPs for platoons.
- Operations included Security patrols through all the villages; interdiction operations to the north and south side of the river; Civil Affair Missions for the Afghani people.



Light Armored Vehicle Family of Vehicles



LAV-25
(25MM CHAIN GUN)

Mission of an LAR Bn:

To conduct reconnaissance, security and economy of force operations, and, within its capabilities, limited offensive or defensive operations that exploit the unit's mobility and firepower



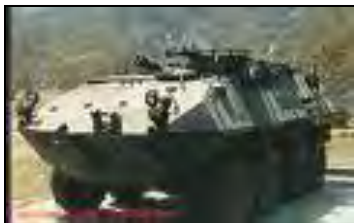
LAV-L
(LOGISTICS)



LAV-R
(RECOVERY)



LAV-AT
(ANTI-TANK)

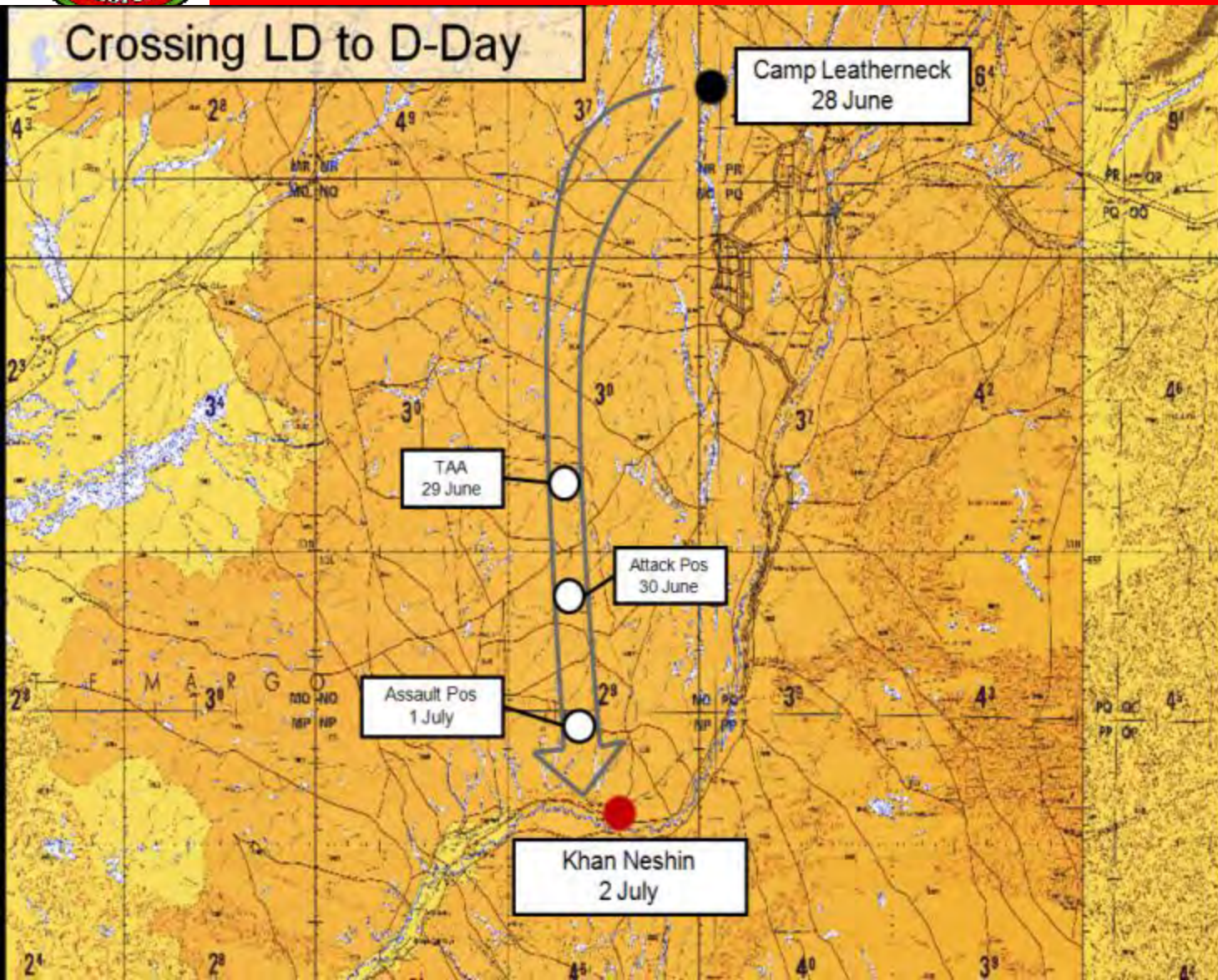


LAV-M
(MORTAR)



Mobility

Crossing LD to D-Day



Terrain

- Co C crossed LD on 28 Jun. The route decided on would take the company into western Afghanistan, staying away from the Helmand River Valley and the population centers IOT increase the stealth of a whole Bn's movement.
- The terrain became 'unforgiving' through some areas; hard packed dirt to sand dunes that stretched for kilometers.
- All the movement was done at night, while during the day we remained in a defensive position.



Terrain





Swimming

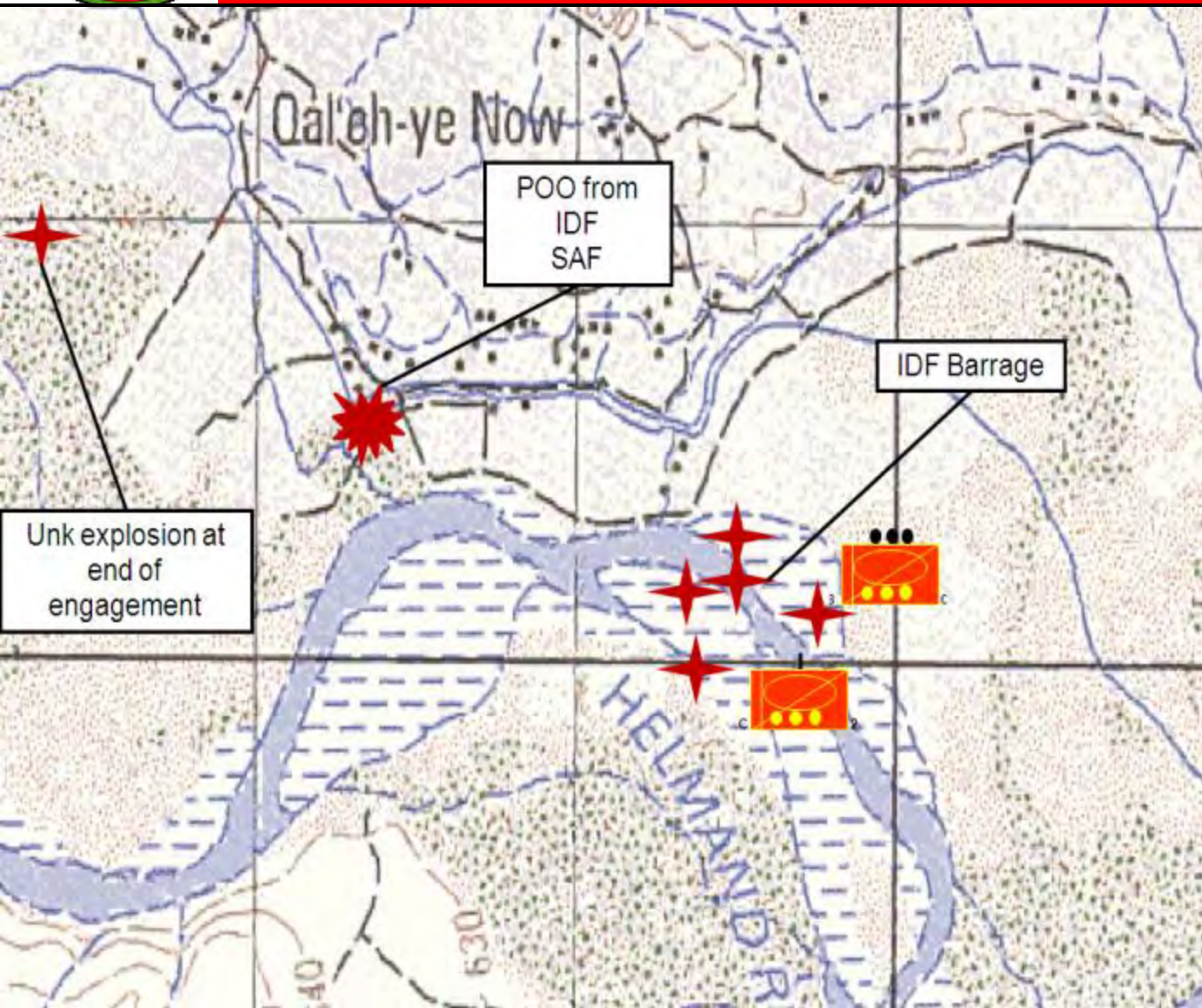


9 Jul 09

- 2d MEB-Afghanistan conducted a coordinated attack along the Helmand River Valley on 2 Jul, where two infantry battalions air assaulted in and 2d LAR made a 150 km night movement through western Afghanistan to seize Khan Neshin.
- Understanding that the Helmand River was a natural obstacle that allowed the enemy freedom of movement south of the river, 2d LAR knew that they could influence the other two battalion's battlespaces because of our ability to SWIM.
- Co C swam the river on 9 Jul, and from that point on, impeded the enemy's ability to maneuver through all of Helmand.



Offensive Action



27 Jul
The company moved through the mountainous terrain of Khan Neshin Gar. 3rd Plt and HQ were exploring the routes to the south of Qual-ye-Now (just west of Khan Neshin) when accurate mortar fire zeroed in on the vehicles. A POO site was identified and a section from 3rd Plt and the two LAV-25s from HQ conducted a combat splash across the river. HQ established a SBF position and allowed 3rd Plt to close distance and dismount scouts. Seven buildings were cleared and 3 men detained. Information from the detainees supported the fact that the enemy didn't realize the capabilities of the vehicles.





IED Strike
Engine side, Front Tire





Suggestions



Gypsy Rack

Tire Pressure





Questions?

3-2 SBCT



**“ARROWHEAD”
OIF Operations Summary**



Agenda



Mission Statement

Operational Environment/Disposition of Forces

Campaign Plan

TF Governance and Civil Capacity

Best practices

SBCT Recommendations

Questions



Arrowhead Mission Statement



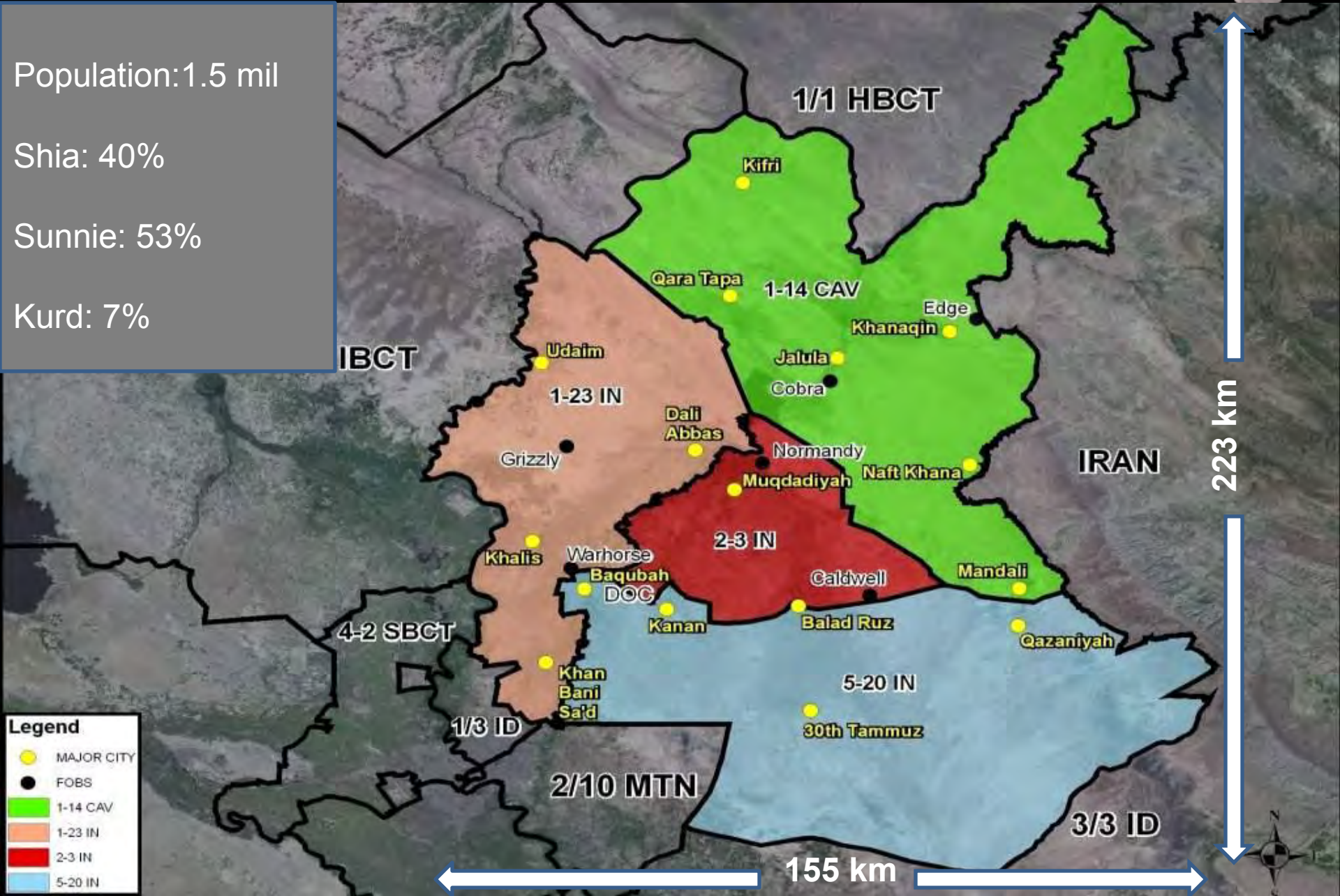
TF Arrowhead enables Iraqi Security Forces and the Government of Iraq to secure and develop the Diyala Province, leading to secure and credible elections while setting the conditions for RIP/TOA with 2-25 SBCT (AAB).



Arrowhead OE/Disposition of Forces



Population: 1.5 mil
Shia: 40%
Sunnie: 53%
Kurd: 7%





Task Organization/Partnership



TF 2-3 IN
Normandy



X



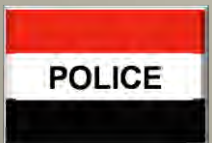
TF 5-20 IN
Warhorse



X



X



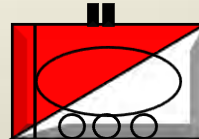
TF 1-23 IN
Grizzly



X



TF 1-14 CAV
Cobra



X



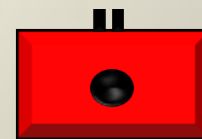
X



X



TF 1-37 GCC
Warhorse

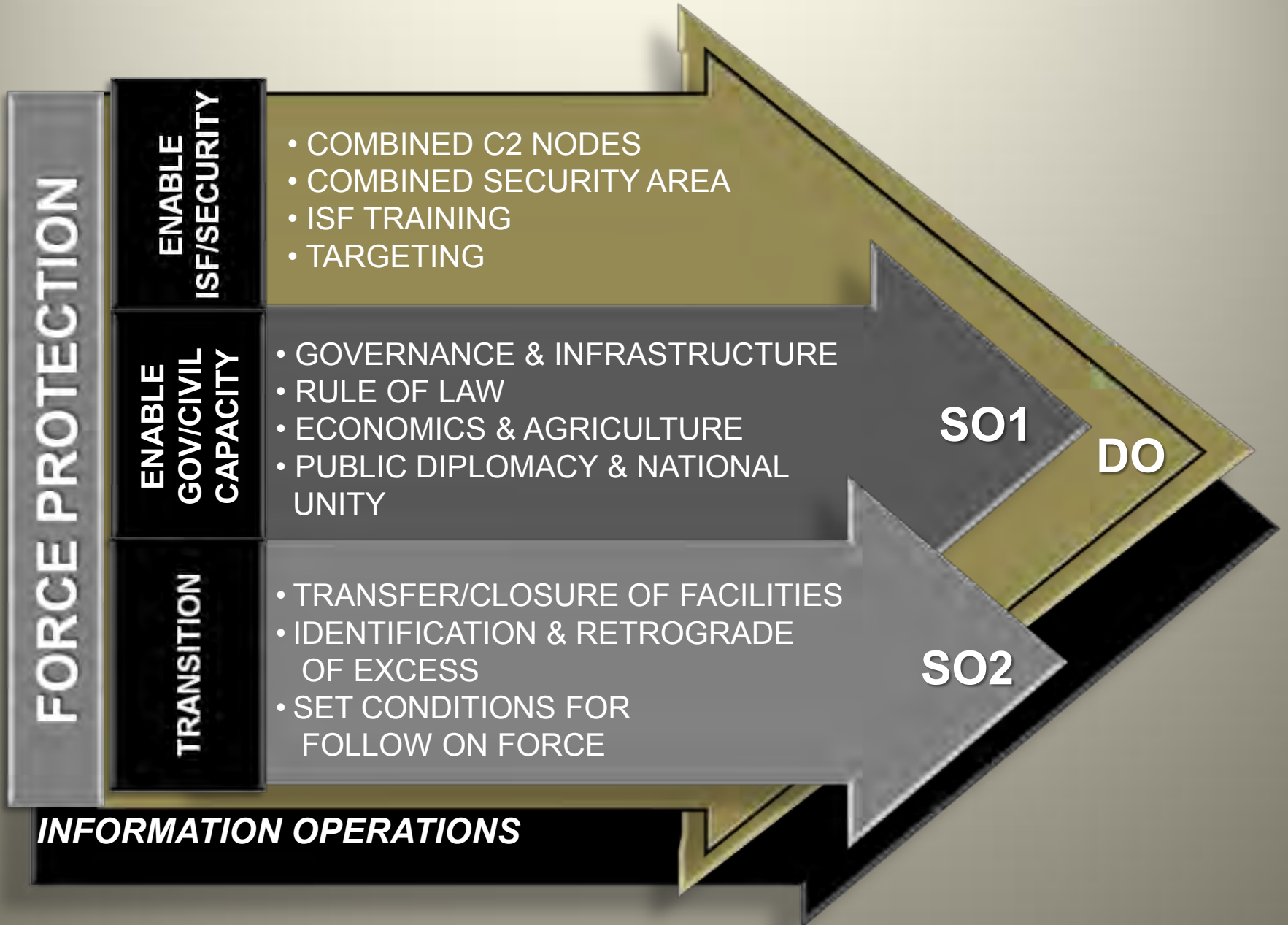


TF 296 BSB
Warhorse





Arrowhead Campaign Plan





TF GCC Mission Statement



TF Governance/Civil Capacity enables and assists the Diyala Provincial Reconstruction Teams in order to facilitate the strengthening of government systems at both the provincial and local (Qadaa and Nahia) levels and the building, nurturing, and maintenance of enduring civil capacities to foster trust in the government of the Diyala Province in the absence of US Forces and PRTs for the foreseeable future.



Arrowhead Best Practices



Best Practices

- Lethal Targeting is possible during stability operations
 - Integration with Task Force and AOB
 - Combined targeting meetings with Diyala Operations Commander , 5th Iraqi Army DIV, Iraqi Police
- Combined C2 nodes: if you help them build it... they will come
- Iraqi Security Forces Training: Train them to train themselves
- Combined Operations: Show them what right looks like (from TLPs through the AAR)
- TF GCC: Enable the experts to do their job

Lessons Learned

- Empower BNs to solve Brigade problems (C-IDF+ targeting)
 - Change task organization to solve problems



Recommendations



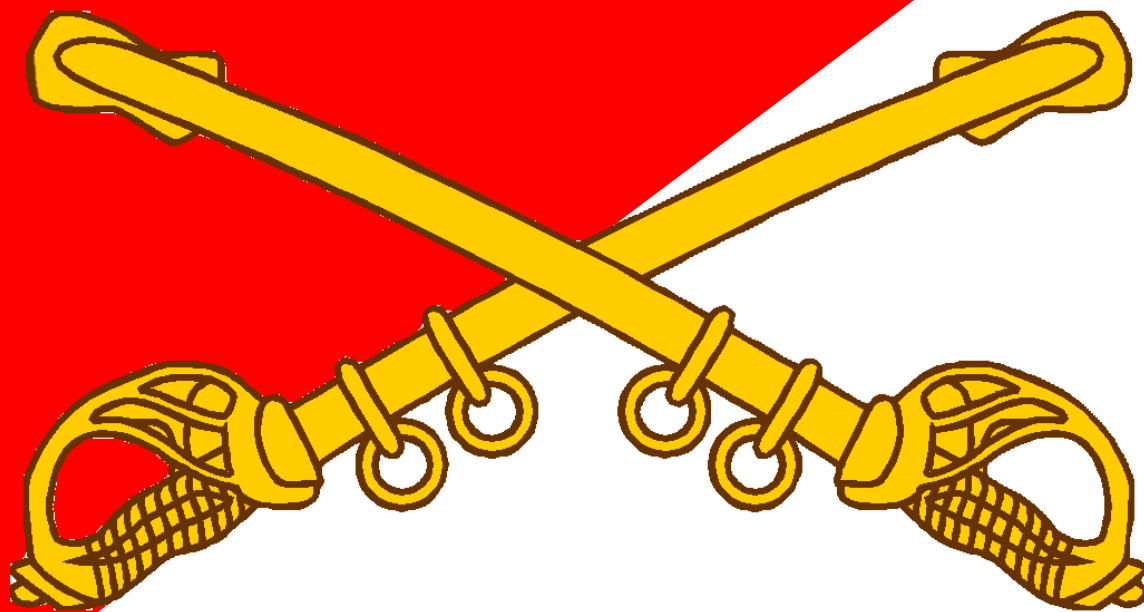
- Retain current Force Structure
- Armored Security Vehicle (ASV) vs. Infantry Carrier Variant (ICV) for Military Police Platoon
- Gun Laying and Positioning System (GLPS) for the Field Artillery Battalion
- Brigade Support Battalion wants to replace their Front Line Ambulances (FLA) with Medical Evacuation Variants (MEV)
- Vehicle for Combat Observation Lasing Team – prefer Fire Support Variant (FSV)
- Strykers in Field Artillery Battalion
 - Infantry Carrier Variant as Prime Mover for M777
 - Command Variant as Fire Direction Computer vehicle
- 60 mm Mortar for Cavalry Troops
- Operations Sergeant Major for Brigade Support BN

Questions



DIETZ

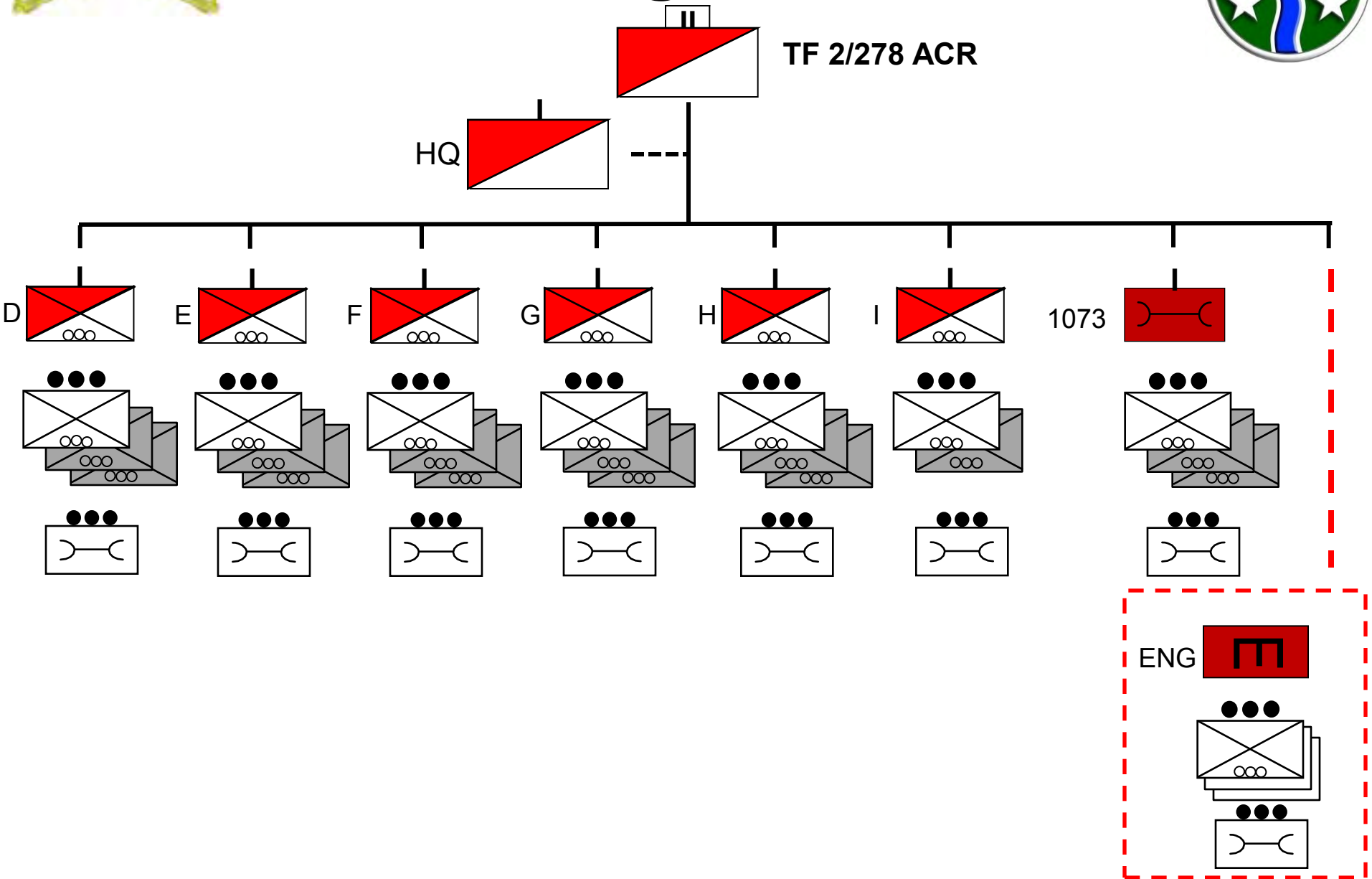
TASK FORCE 278 ACR



278TH ARMORED CAVALRY REGIMENT

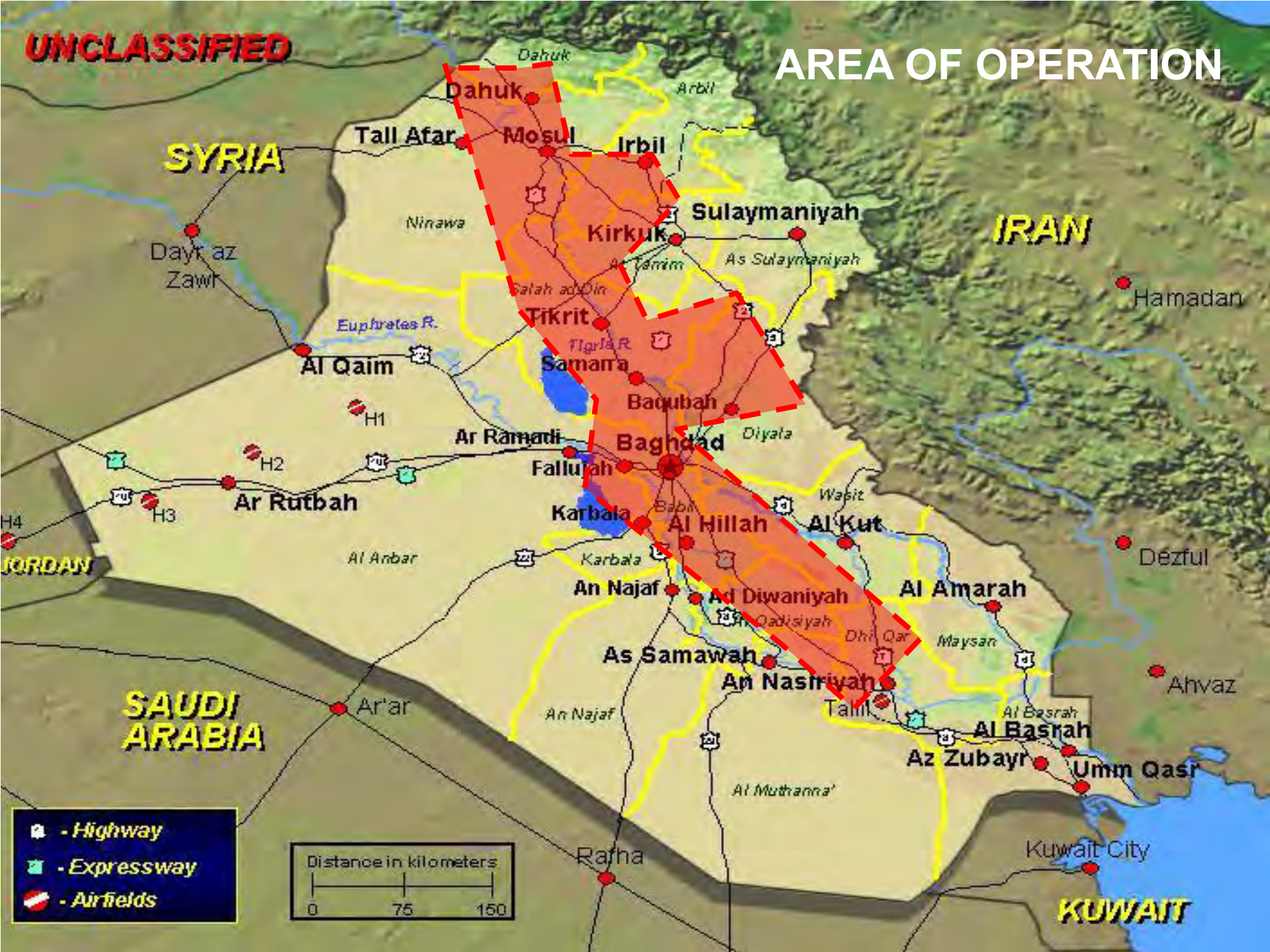


Task Organization



UNCLASSIFIED

AREA OF OPERATION



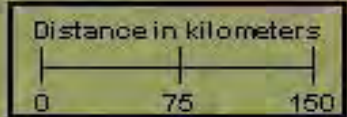
SYRIA

IRAN

SAUDI ARABIA

KUWAIT

- Highway
- Expressway
- Airfields





Convoy Configuration

Each truck represents 10 KBR/TCN vehicles



Trail section consists of Wrecker for recovery, and MRAP for rear security



Flex trucks, with 10 white trucks in between each one.



Scout and Lead trucks



Mobility

- Hard surface road networks
- Off Road Capability Limited
- Turn Radius (MAXPRO+ vs. RG33)
- Speed Kills
 - Rollover Threat





Sustainability

- Recovery Challenges
 - KBR Assistance During Missions
- Spare Tire Mounts
- Armor Removal
- Availability of Class IX
- Training



Lethality

- Stable Firing Platform
- Universal Mount
- Lower Silhouette
- Hellfire Lights and Force Protection





Survivability

- Our Experience “MRAPs Save Soldier’s Lives”
- Plus/EFP Armor preferred over Reactive Armor





Connectivity

- Outstanding Crew Internal Communication
 - Bose Headsets
- Radio Placement
 - Radio Control Monitor
- Blue Force Tracker and Movement Tracking System





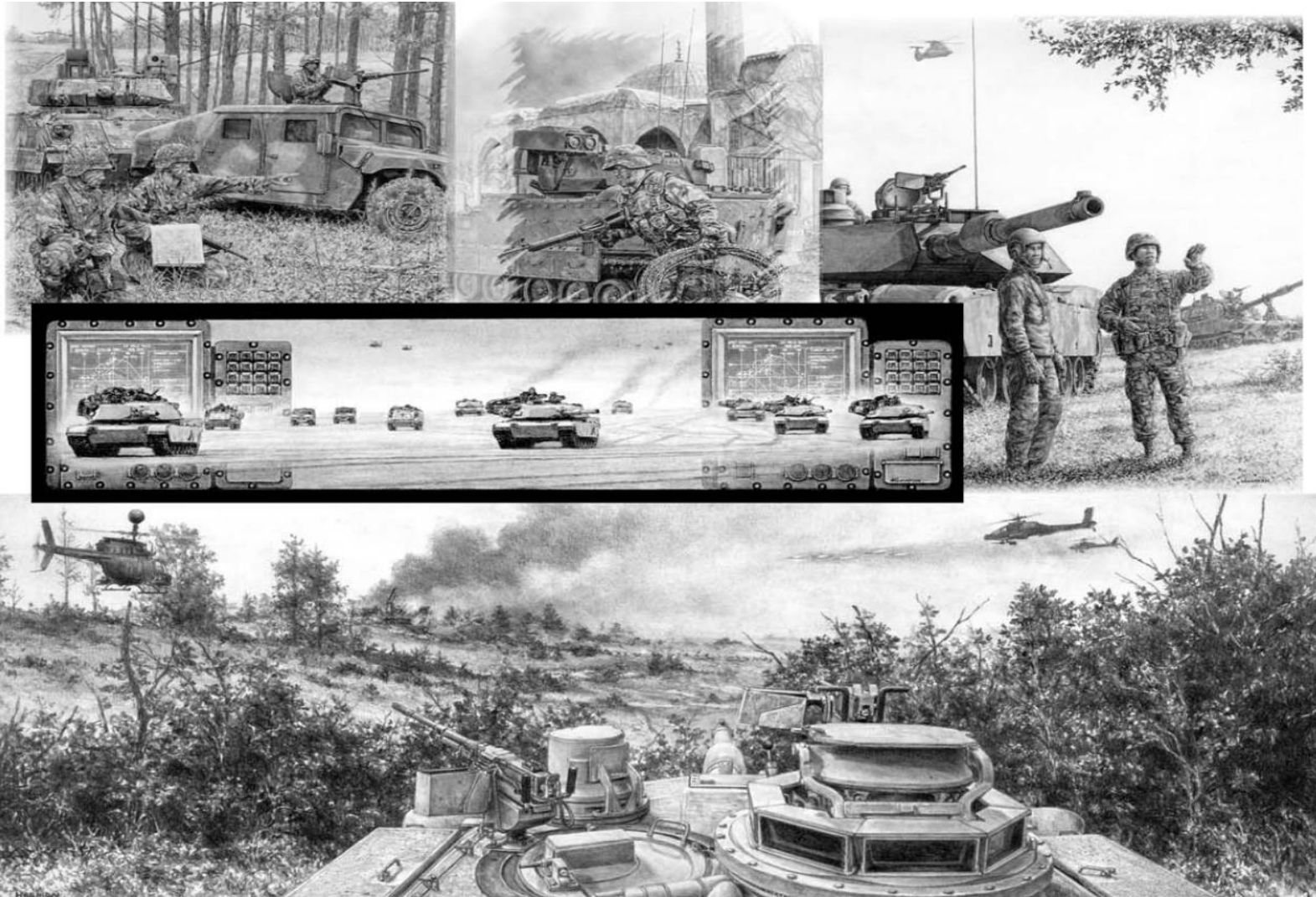
Add On Equipment

- Self Protective Adaptive Roller Kit (Sparks Mine Roller)
- CREW Systems
 - CVRJ, DUKES
 - RHINO
- IED Lights





QUESTIONS?

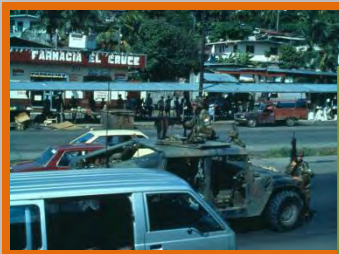
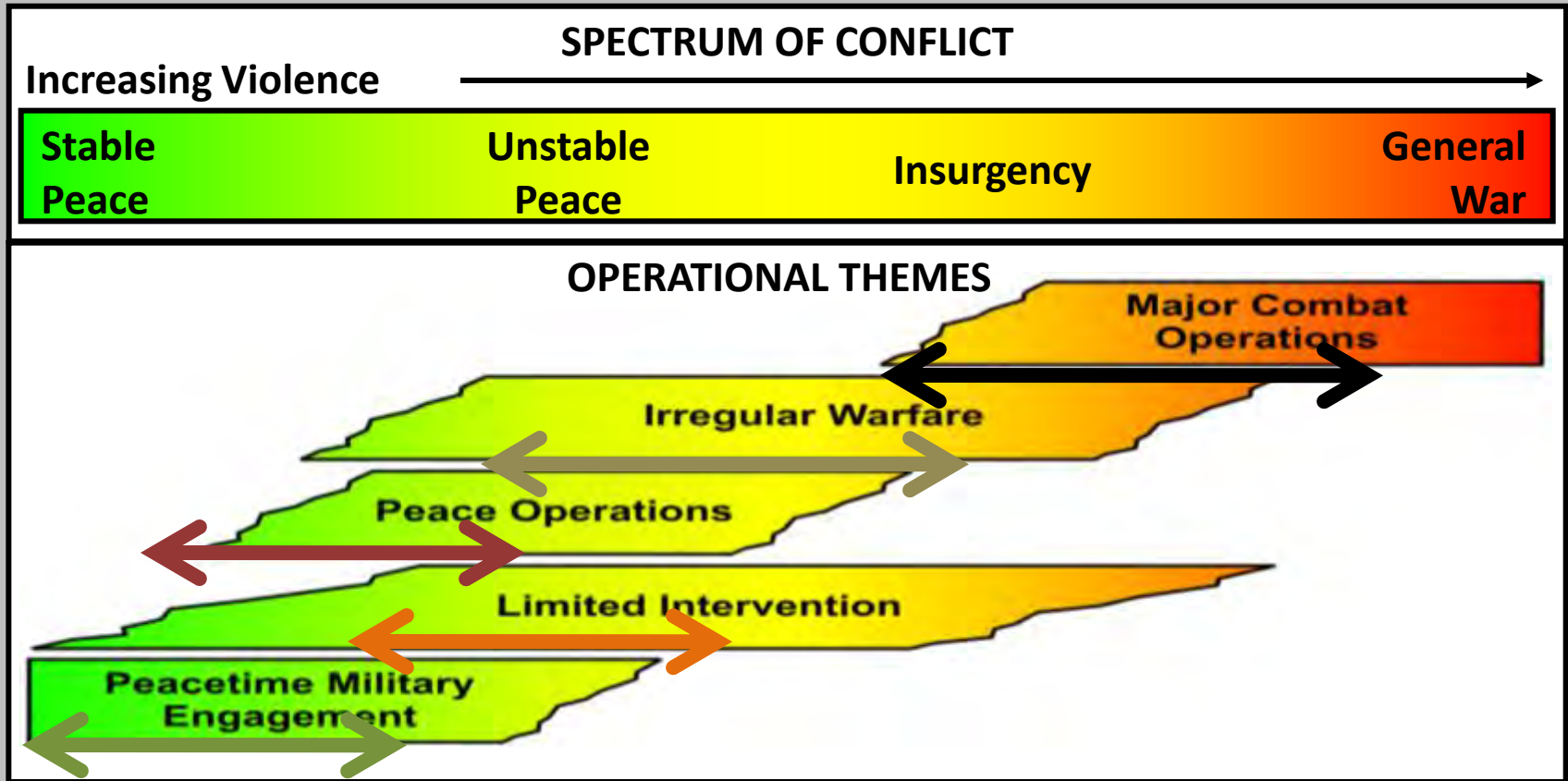


2010 Combat Vehicle Conference

Twelve Lessons in Twenty Years

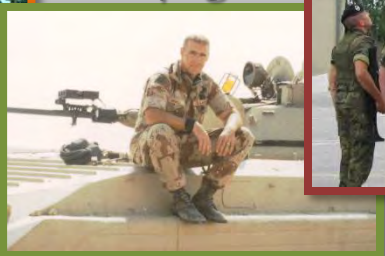
COL Pete Newell
COM: (703) 704-2216
CELL: (571) 423-9504
peter.newell@conus.army.mil

The Spectrum of Conflict in Twenty Years



Just Cause '89

Dsrt Sprg '93



KFOR '03



OIF '04



OIF '09

Leaders have to see, hear and feel the fight



C2 has to move



"In-stride" evolution



We are going to fight in the city



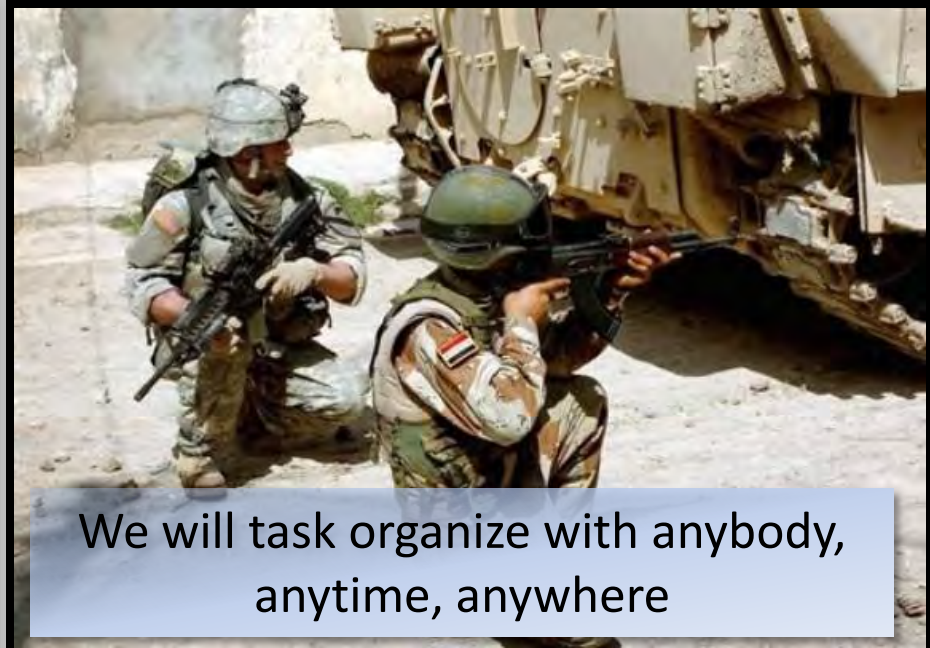
Mass and Firepower make a statement



Precision takes on new meaning when it's "danger close"



You don't "own" it unless these guys are on it



We will task organize with anybody, anytime, anywhere

What's truly useful isn't always pretty



"Combat" Support has to go with you



The environment votes



You have to keep the coalition together

2010 Combat Vehicle Conference

Twelve Lessons in Twenty Years

COL Pete Newell
COM: (703) 704-2216
CELL: (571) 423-9504
peter.newell@conus.army.mil

PREDICTING FUTURE WARS?

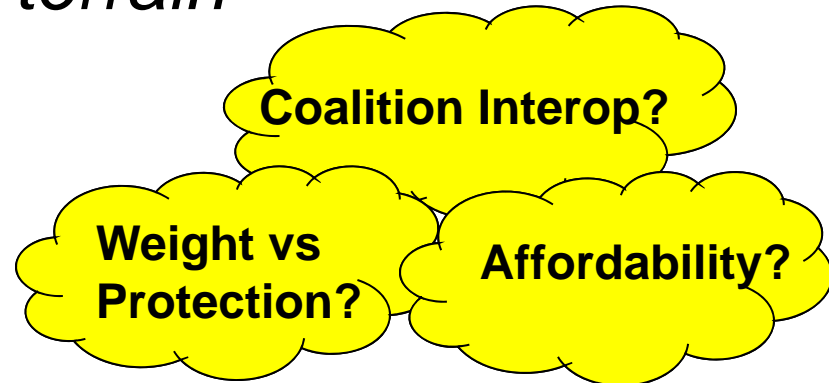


WHAT ARE THE WARFIGHTER'S REQUIREMENTS?

- *Getting to/around the theater of operations quickly*
- *Lethal precision/survivable (within reason)*
- *Utility, weight of individual equipment is critical*
- *Network is cyber “center of gravity”*
- *Operate in complex, harsh terrain*

SO WHAT:

- ✓ Modernization and/or Recap??
- ✓ Break IT “Silos”
- ✓ Ruggedized Individual Kit
- ✓ Hybrid War Application
- ✓ Requirement to “in the hands of” timeline – new paradigm



NDIA OBSERVATIONS TODAY



- *Sustainment, training, education up front (Include RC, ARFORGEN)*
- *Joint distributed ops (JDO)*
- *Tough choices: modernization or force structure, readiness*
- *Engage NCO's, CO grade off, maint WO's*
- *“Expeditionary” (Land Forces)*