2008 Combat Vehicles Conference

"Urgent Need Today For Tomorrow's Capabilities"

Dearborn, MI

20-22 October 2008

Agenda

Tuesday, 21 October 2008

WELCOME TO DETROIT REMARKS

Mr. John "Jack" Dugan, Deputy Commander, TACOM LCMC

KEYNOTE ADDRESS

LTG Michael A. Vane, USA, Director, Army Capabilities Integration Center United States Army Training and Doctrine Command

PANEL DISCUSSION: *"Future Combat Systems (FCS)"*

Panelists:

- Manned Ground Vehicle Overview, COL Bryan McVeigh, Project Manager, Future Combat Systems (BCT)
- Manned Ground Vehicles Non-Line of Sight Cannon Overview, LTC Robert (Bob) Hannah, Project Manager, Future Combat Systems (BCT)
- Mounted Combat Systems Unmanned Ground Vehicles Overview, LTC Winfield Keller, Project Manager, Future Force Unmanned Aircraft Systems

GENERAL SESSION - *"Urgent Need Today For Tomorrow's Capabilities"*

BG Michael M. Brogan, USMC Commander, Marine Corps Systems Command

PANEL DISCUSSION: *"PEO & PM Land Systems Command"*

Moderator: Dr. Robert Lusardi Deputy Program Manager Light Armored Vehicles, U.S. Army TACOM

Panelists:

- Test & Evaluation, Expeditionary Fighting Vehicle (EFV) Program, Lt Col Daryl Crane, USMC Deputy Director, Test & Evaluation, PM Advanced Assault Amphibian

PANEL DISCUSSION: ***" PEO & PM Ground Combat Systems"***

Moderator: Mr. Michael Viggato, Deputy PEO, Ground Combat Systems

Panelists:

- Heavy Brigade Combat Team, COL Paul R. Lepine, PM HBCT
- PM Mine Resistant Ambush Protection (MRAP) Stryker Brigade Combat Team, Col. Robert Schumitz, PM SBCT
- Lightweight 155 MM Howitzer, Mr. Michael Viggato, Deputy PEO, Ground Combat Systems
- Modular Brigade Enhancements Ground Combat Support (GCS), Readiness & Sustainment (R&S), Mr. Kenneth Kish

Wednesday, 22 October 2008

R&D/FUTURE PROGRAMS

Dr. Grace Bochenek, Director, U.S. Army Tank Automotive Research, Development and Engineering Center

WAR PANEL: ***"Operation Iraqi Freedom"***

- Bradley Battalion Commander, Captain Brian Gilbert
- MRAP EOD Company Commander, Captain James Kelley
- Former Stryker Company Commander, Captain Damian M. Gill
- Marine with light Combat Experience, Major Innes Quiroz

NDIA
NATIONAL DEFENSE INDUSTRIAL ASSOCIATION
STRENGTH THROUGH INDUSTRY & TECHNOLOGY

PROMOTING NATIONAL SECURITY SINCE 1919

2008 COMBAT VEHICLES CONFERENCE

"URGENT NEED TODAY FOR TOMORROW'S CAPABILITIES"

HIGHLIGHTS TO INCLUDE:

- Future Combat Systems (FCS)
- PEO & PM Land Systems, USMC
- PEO & PM Ground Combat Systems
- R&D/Future Programs
- War Panel "Operation Iraqi Freedom"

OCTOBER 20-22, 2008
WWW.NDIA.ORG/MEETINGS/9620

HYATT REGENCY DEARBORN ▸ DEARBORN, MICHIGAN

EVENT #9620

MONDAY, OCTOBER 20, 2008

3:00 PM - 6:30 PM
Registration Open

5:00 PM - 6:30 PM
Welcome Reception
drinks and light hors d'oeuvres provided

TUESDAY, OCTOBER 21, 2008

7:15 AM - 7:00 PM
Registration Open

7:15 AM - 8:15 AM
Continental Breakfast
provided

8:15 AM - 11:30 AM
General Session I
Session Chair:
LTG John S. Caldwell, USA (Ret)
Parametric Technologies
The Spectrum Group
Chairman, Combat Vehicles Division, NDIA

9:30 AM - 9:50 AM
Morning Break
provided

11:30 AM - 12:30 PM
Lunch
provided

MONDAY, OCTOBER 20, 2008

3:00 PM - 6:30 PM — **REGISTRATION OPEN**

5:00 PM - 6:30 PM — **WELCOME RECEPTION**

TUESDAY, OCTOBER 21, 2008

7:15 PM - 7:00 PM — **REGISTRATION OPEN**

7:15 AM - 8:15 AM — **CONTINENTAL BREAKFAST**

8:15 AM - 11:30 AM — **GENERAL SESSION - SESSION I**

"Urgent Need Today For Tomorrow's Capabilities"

Session Chair: LTG John S. Caldwell, USA (Ret)
Parametric Technologies Corporation
The Spectrum Group
Chairman, Combat Vehicles Division, NDIA

8:15 AM — **ADMINISTRATIVE REMARKS**
- LTG John S. Caldwell, USA (Ret)
  Parametric Technologies Corporation
  The Spectrum Group
  Chairman, Combat Vehicles Division, NDIA

8:25 AM — **WELCOME TO DETROIT REMARKS**
- Mr. John "Jack" Dugan
  Deputy Commander, TACOM LCMC

8:45 AM — **KEYNOTE ADDRESS**
- LTG Michael A. Vane, USA
  Director, Army Capabilities Integration Center, United States Army Training and Doctrine Command

9:30 AM - 9:50 AM — **MORNING BREAK**

9:50 AM — **ACQUISITION KEYNOTE ADDRESS**
- BG Anthony J. Tata, USA
  Deputy Director, JIEDDO

10:30 AM — **PANEL DISCUSSION**

"Future Combat Systems (FCS)"

Moderator: BG R. David Ogg, Jr., USA
Deputy Program Manager, Future Combat Systems (BCT), Platforms

Panelists:
- **Manned Ground Vehicle Overview**
  COL Bryan McVeigh, USA
  Project Manager, Future Combat Systems (BCT), Manned Ground Vehicles
- **Non-Line of Sight Cannon Overview**
  LTC Robert (Bob) Hannah, USA
  Project Manager, Future Combat Systems (BCT), Mounted Combat Systems
- **Unmanned Ground Vehicles Overview**
  LTC Winfield Keller, USA
  Project Manager, Future Force Unmanned Aircraft Systems

11:30 AM - 12:30 PM — **LUNCH**

TUESDAY, OCTOBER 21, 2008

12:30 PM - 5:30 PM

GENERAL SESSION - SESSION II

"Urgent Need Today For Tomorrow's Capabilities"

Session Chair: Mr. Roy Perkins
BAE Systems

- BG Michael M. Brogan, USMC
  Commander, Marine Corps Systems Command

1:00 PM

PANEL DISCUSSION

"PEO & PM Land Systems Command"

Moderator: Dr. Robert Lusardi
Deputy Program Manager Light Armored Vehicles, U.S. Army TACOM

Panelists:

- **Test & Evaluation, Expeditionary Fighting Vehicle (EFV) Program**
  LtCol Daryl Crane, USMC
  Deputy Director, Test & Evaluation, PM Advanced Assault Amphibian
- **Assault Amphibious Vehicles**
  Mr. Bryan Prosser
  Program Manager, Assault Amphibious Vehicles
- **Tank Systems**
  Mr. Philip Patch
  Program Manager, Tank Systems

2:30 PM - 3:00 PM

AFTERNOON BREAK

3:00 PM

PANEL DISCUSSION

" PEO & PM Ground Combat Systems"

Moderator: Mr. Michael Viggato
Deputy PEO, Ground Combat Systems

Panelists:

- **Heavy Brigade Combat Team**
  COL Paul Lepine, USA,
  PM HBCT
- **Stryker Brigade Combat Team**
  COL Robert Schumitz, USA
  PM SBCT
- **Lightweight 155 MM Howitzer**
  Mr. Michael Viggato
  Deputy PEO, Ground Combat Systems
- **PM Robotics**
  Mr. Jeffrey Jaczkowski
  RS JPO
- **Ground Combat Support (GCS), Readiness & Sustainment (R&S)**
  Mr. Kenneth Kish
  GCS R&S

4:30 PM - 6:00 PM

ANNUAL CONFERENCE RECEPTION

TUESDAY, OCTOBER 21, 2008

Continued

12:30 PM - 5:30 PM
General Session II
Session Chair:
Mr. Roy Perkins
BAE Systems

2:30 PM - 3:00 PM
Afternoon Break
provided

4:00 PM
Adjourn for the Day

4:30 PM - 6:00 PM
Annual Conference Reception
drinks and light hors d'oeuvres provided

COMBAT VEHICLES DIVISION INFORMATION

Chairman

LTG John S. Caldwell, USA (Ret)
Parametric Technologies Corporation
The Spectrum Group

Steering Committee

Col Reed T. Bolick, USMC (Ret)
Cypress International

Mr. James R. Williams
General Dynamics

Mr. Roy Perkins
BAE Systems

Mr. Chuck Prikopa
BAE Systems

Mr. John Whitehead
Omega Training

Government Liason Representative

Ms. Kimberly Maples
TACOM

WEDNESDAY, OCTOBER 22, 2008

7:00 AM - 12:15 AM
Registration Open

7:00 AM - 8:00 AM
Continental Breakfast
provided

8:00 AM
Administrative Remarks

9:00 AM - 12:15 PM
General Session III
Session Chair:
Mr. Chuck Prikopa
BAE Systems

10:30 AM - 11:00 AM
Morning Break
provided

12:15 PM
Conference Adjourns

COMBAT VEHICLES DIVISION

The primary objective of the Combat Vehicles Division of NDIA's is to enhance the security of the United State by promoting communications and interaction between defense industry, government, and military in the area of combat vehicles activities.

WEDNESDAY, OCTOBER 22, 2008

7:00 AM - 12:15 AM — **REGISTRATION OPEN**

7:00 AM - 8:00 AM — **CONTINENTAL BREAKFAST**

8:00 AM - 12:15 AM — **GENERAL SESSION - SESSION III:**

"Introducing Future Capabilities into Today's Fighting Forces"

Session Chair: Mr. Chuck Prikopa
BAE Systems

8:00 AM — **ADMINISTRATIVE REMARKS**
- Mr. Chuck Prikopa
  BAE Systems

8:10 AM — **R&D/FUTURE PROGRAMS**
- Dr. Grace Bochenek
  Director, U.S. Army Tank Automotive Research, Development and Engineering Center

9:00 AM — **WAR PANEL**

"Operation Iraqi Freedom"

Moderator : MG Julian Burns, USA (Ret)
Vice President Business Development, BAE Systems

Panelists:
- LTC David Lesperance, USA
  Battalion Commander, 1st 8th Cavalry, 1st Cavalry Division
- CSM Robert French, USA
  Battalion Command Sergeant Major, 1st 8th Cavalry, 1st Cavalry Division
- Major Innes Quiroz, USMC
  Light Armored Vehicle Commander, Marine Corps Systems Command
- CPT James Kelly, USA
  Assistant TRADOC Capability Manager-Infantry Brigade Combat Team

10:30 AM - 11:00 AM — **MORNING BREAK**

11:00 AM — **GREYBEARD PERSPECTIVE**
- GEN Paul Kern, USA (Ret)
  President, AM General

12:00 PM — **CLOSING REMARKS**
- LTG John S. Caldwell, USA (Ret)
  Parametric Technologies Corporation
  The Spectrum Group
  Chairman, Combat Vehciles Division, NDIA

12:15 PM — **CONFERENCE ADJOURNS**

NOTES

RDECOM

TARDEC

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Emerging Technologies For the Future Fight

Grace M. Bochenek, Ph.D.
Director, U.S. Army Tank Automotive Research, Development and Engineering Center

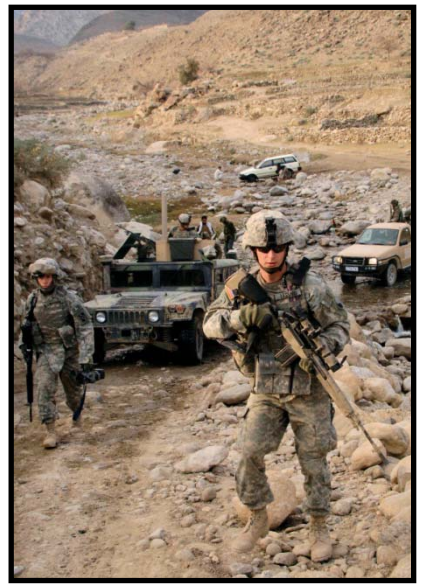
It's All About ... the Warfighter

Agenda

- The Current Fight
- Building for the Future Fight *NOW*
  - **Power & Energy**
  - **Robotics**
- Partnering with the Nation's Best
- Building the Future Workforce

Supporting Today's Fight

The Current Fight



Tackling the National Challenges

DoD Strategic Drivers and Energy Security Goals

- **Increase force protection**
  - Fewer fuel convoys means fewer people and systems in harm's way
- **Increase sustainability**
  - Operate for longer / go farther without resupply
  - Reduce O&S costs
  - Crude oil closed at $96.37/Bbl on 11-7-07; DoD standard (refined) price is additional $25/Bbl
  - Free up manpower and equipment
- **Reduce Dependency on foreign oil**
  - Reduce revenue flow to unfriendly / unstable nations

"For too long our nation has been dependent on foreign oil…and the way forward is through technology."
President George W. Bush, State of the Union Address, 23 January 2007

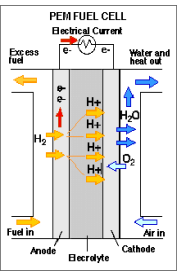
"We've also got to address the challenges of energy security and global climate change. We need to harness the power of technology
President George W. Bush, Speech at the Asia-Pacific Economic Cooperation Business Summit, 7 August 2007

"**Reducing the military's dependence on fuel for power generation could reduce the number of road-bound convoys.**"
U.S. Marine Corps Maj. Gen. Richard Zilmer, Defense News, August 2006

DOD Perspective: The Energy Security Challenge

Supply Security

Demand Reduction



Supply

- **Conventional fossil fuels**
- **Synthetic fuels** (e.g. coal, natural gas derived fuels)
- **Other alternative fuels** (e.g. renewable jet and diesel, biomass, alcohols, hydrogen, etc.)
- **Renewables** (e.g. solar, geothermal, wind, wave/ocean)
- **Novel supply** (e.g. fuel cells)
- **Nuclear**
- **Exotics** (e.g. isomers)
- **Local electrical grid**

Demand

- **Conservation Initiatives**
- **Fixed base**
- **Tactical base**
- **Platforms**
- **Efficiency**
- **Life-Cycle Cost**

Assured Distribution

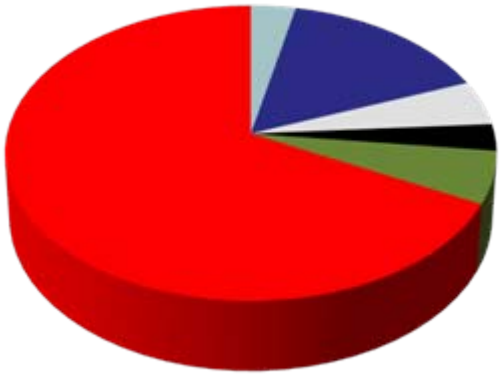
- **Direct oil / fossil fuel costs**
- **Policy, processes and risk assessment**
- **Refining capacity**
- **Energy availability**
- **Doctrine**

Convergence for Energy Security

U.S. Army Perspective

Peacetime Consumption
(DSB Report)

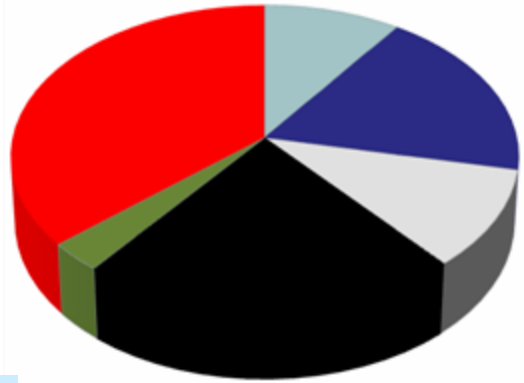
112.4 Trillion Btu



- Combat Vehicles (3%)
- Combat Aircraft (16%)
- Tactical Vehicles (5%)
- Generators (3%)
- Non-Tactical Vehicles (6%)
- Facilities (67%)

Wartime Consumption
(DSB Report)

206.6 Trillion Btu

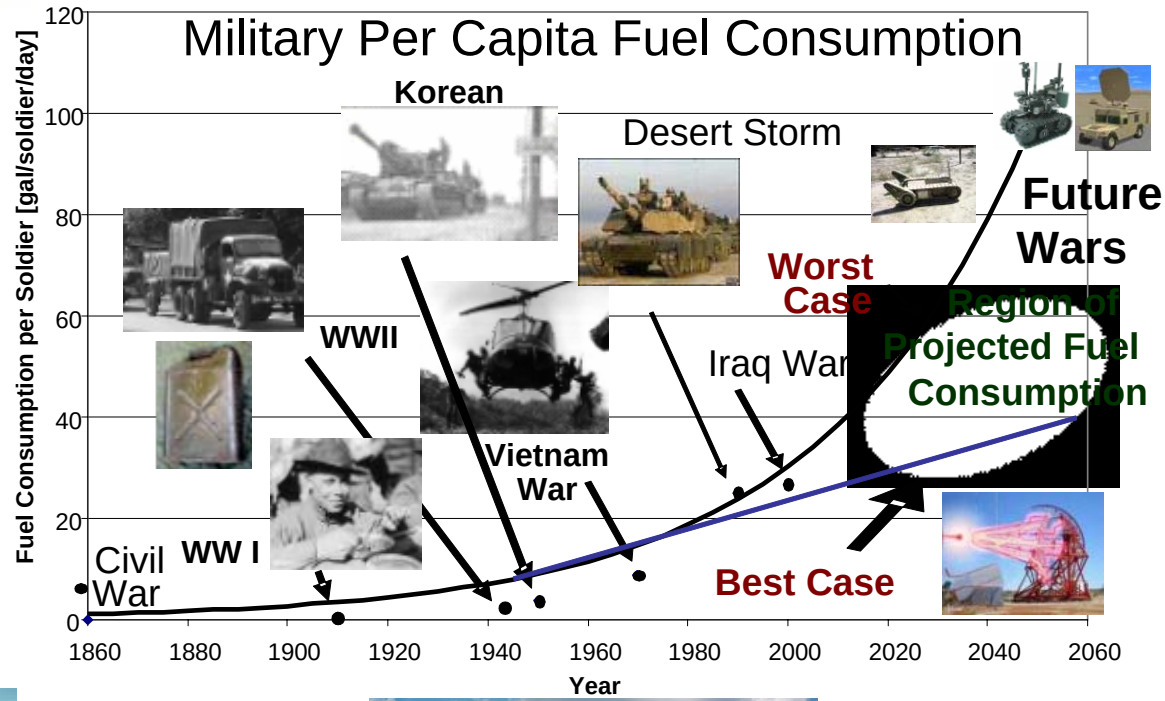


- Combat Vehicles (10%)
- Combat Aircraft (19%)
- Tactical Vehicles (11%)
- Generators (22%)
- Non-Tactical Vehicles (3%)
- Facilities (35%)

Source : Report of the Defense Science Board Task Force on DoD Energy Strategy "More Fight – Less Fuel" published Feb. 2008

The Challenges

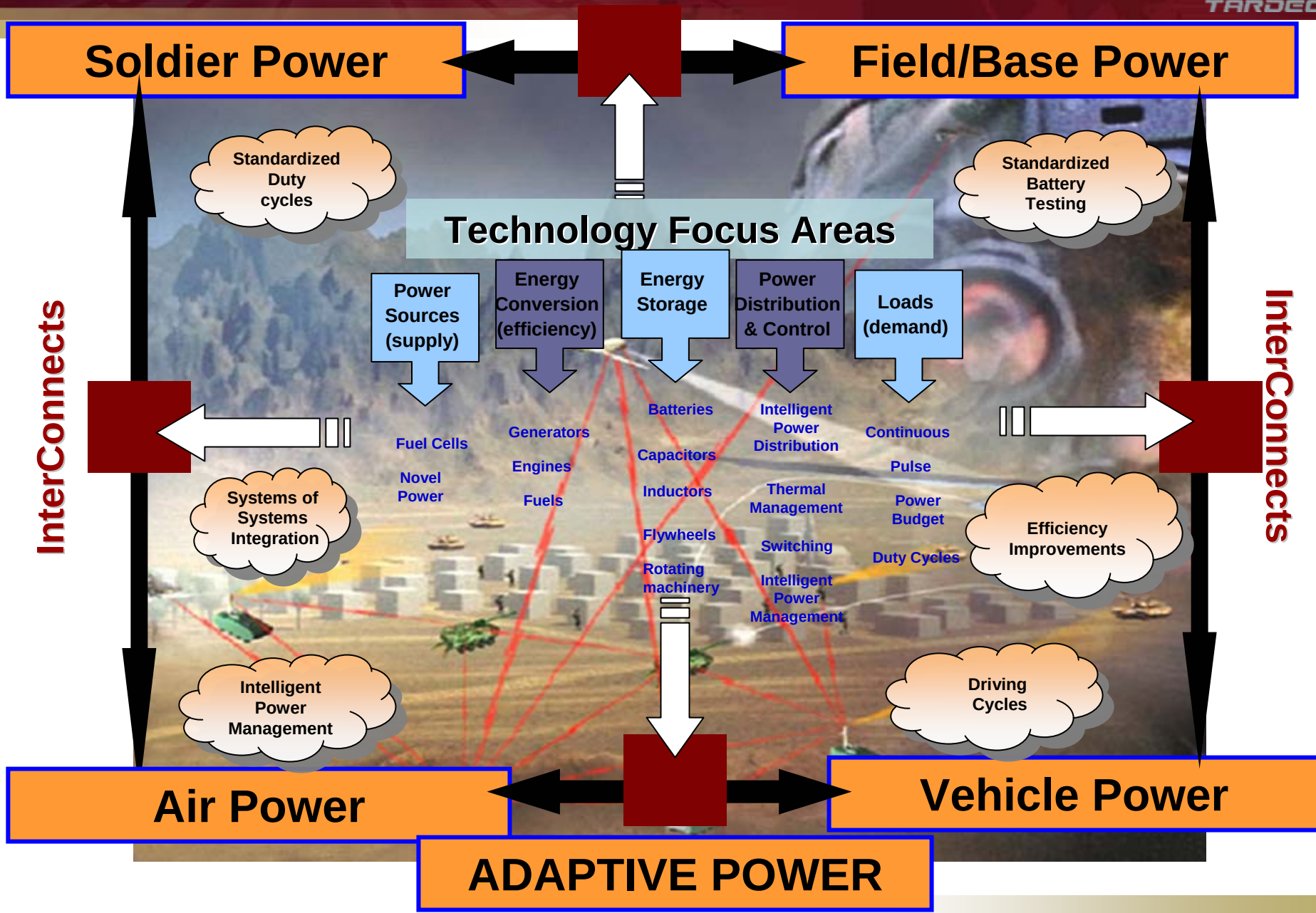
- Battlefield consumption of energy increasing
- Energy security problematic
- Operational issues
- Increased emphasis on system power metrics



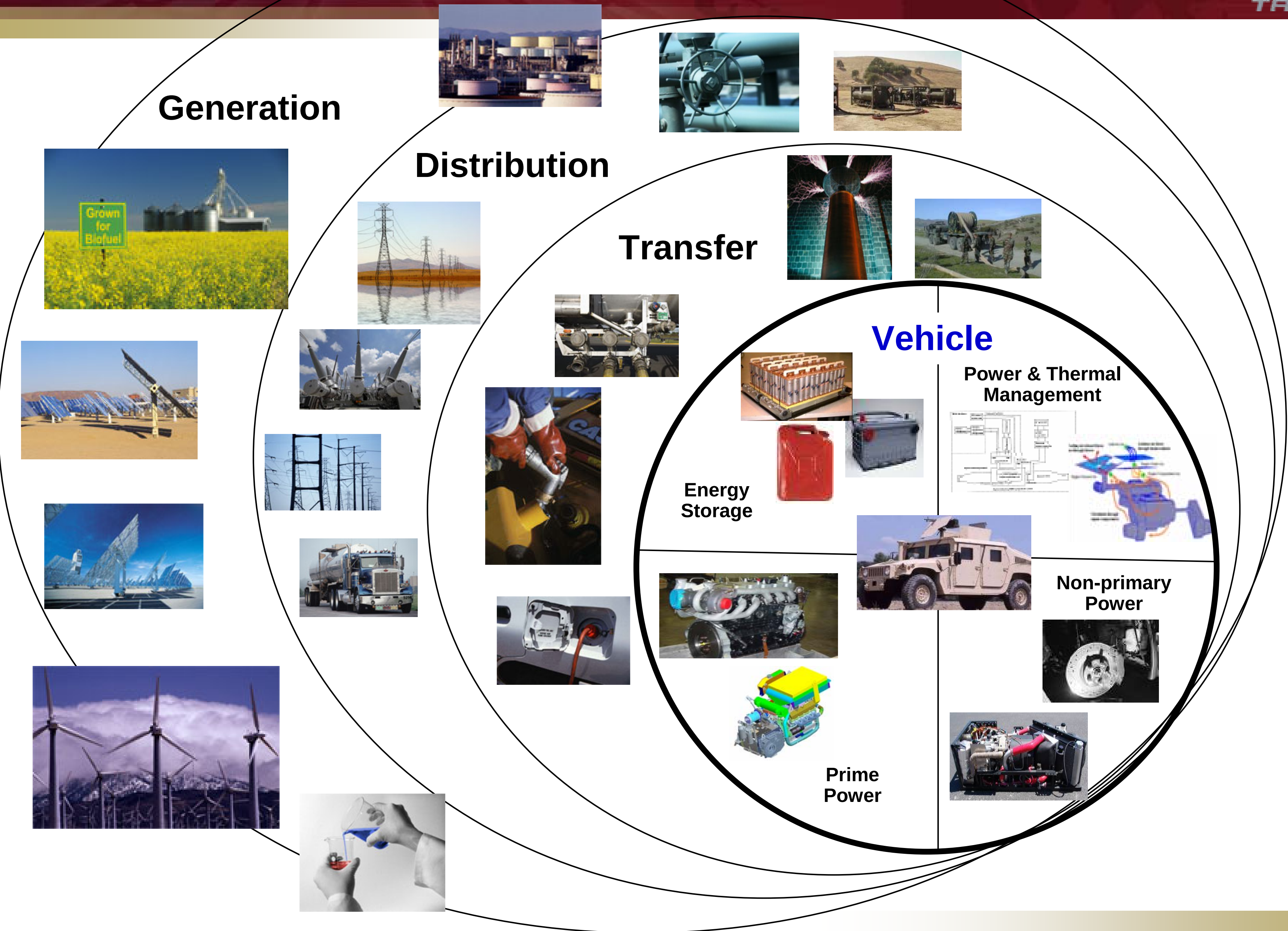
Discarded Batteries (90% Still Usable)

The HMMWV has progressed from a 85 *amp alternator to a* 400 *amp alternator*

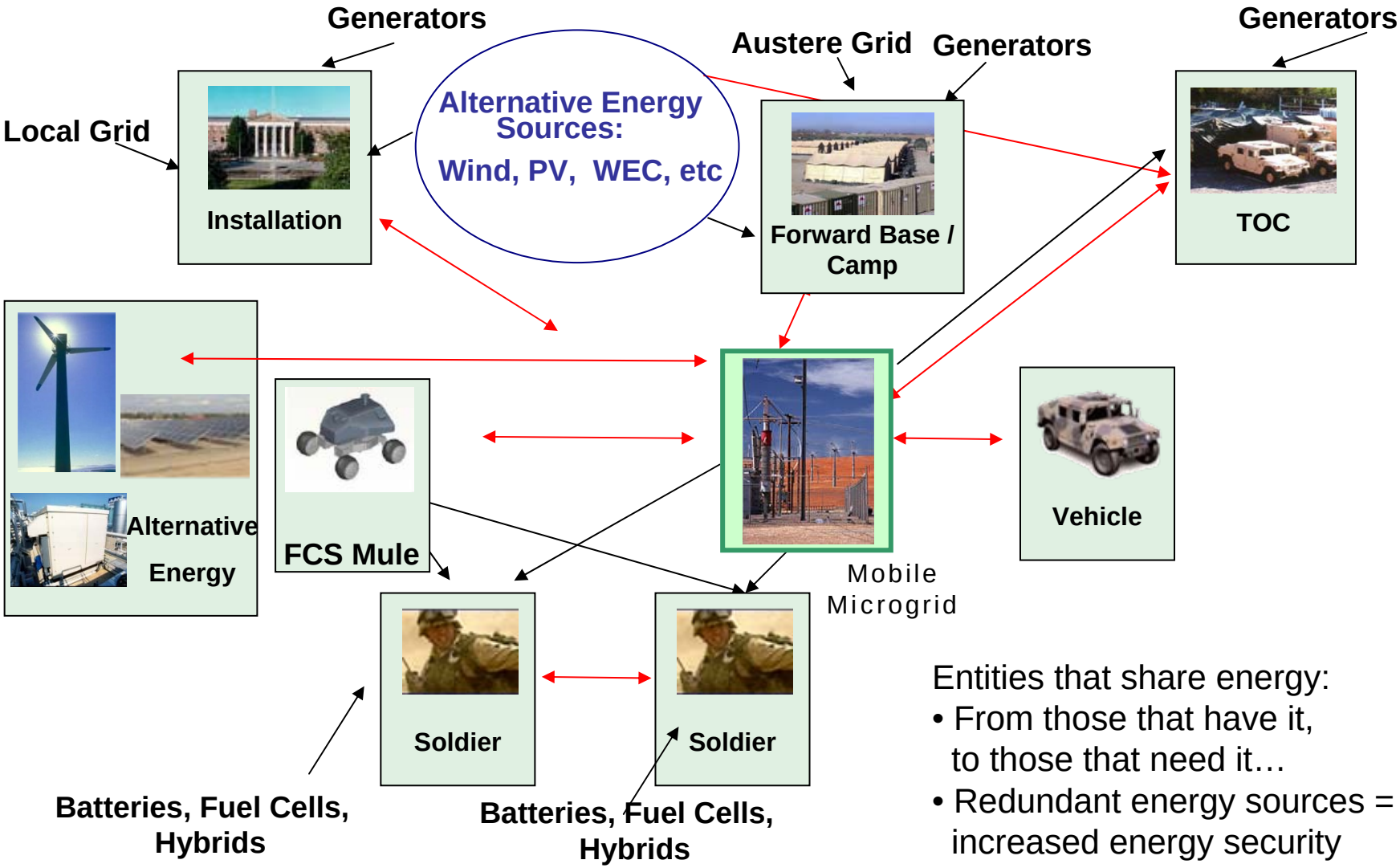
Power and Energy Vision and Focus



Energy Layers



Increased Power & Energy Sharing



Entities that share energy:

- From those that have it, to those that need it…
- Redundant energy sources = increased energy security

Improving *energy* capability through holistic power sharing - you're in the fight...!

Hybrid-Electric Technology

COMPONENTS

Component Elements

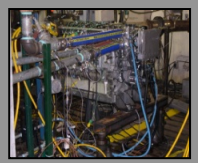
DC/DC Converters

Motors

Batteries

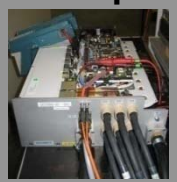
Subsystem Elements

Engines



Engine Generator

High Temperature Electronics



High Temperature Power Electronics

SYSTEM INTEGRATION

Engine Generator Test Lab (EGTL) Warren, MI

[redacted]

Power & Energy SIL Santa Clara, CA

[redacted]

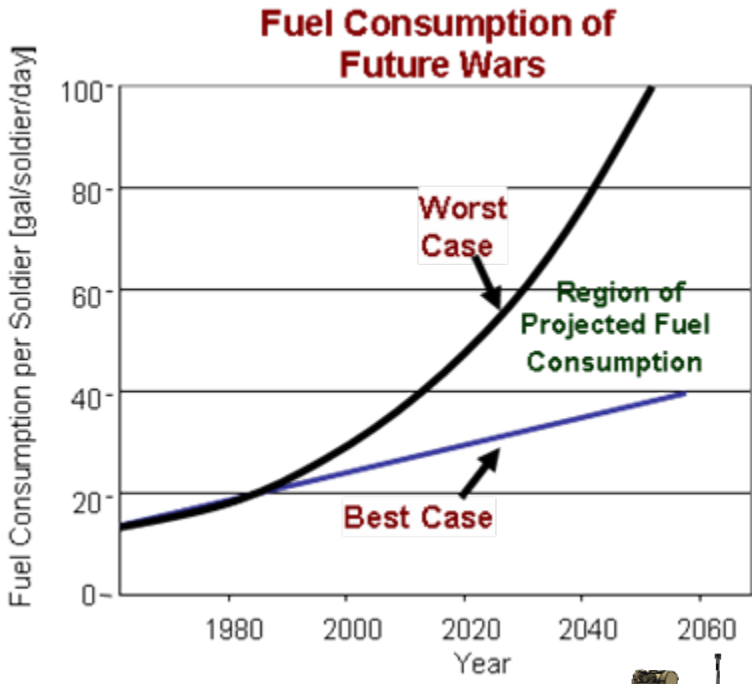
FCS NLOS-C

Design Benefits
No Mechanical Link
No Drive Shaft
Design Flexibility
Improved Maintainability
Lower Silhouette

Realizing the Vision for a Hybrid-Electric Combat Vehicle

Hybrid-Electric Benefits

- **Silent Watch/Mobility**
- **Improved energy efficiency**
- **Fuel economy and emissions reduction**
  - — Reduced logistics burdens
  - — Regenerative braking / energy recovery
- **Enhance functionality, flexibility, power quality, and management of on-board power**
  - — Net-centric warfare and C4ISR
  - — Extra power to handle peak electronic loads
  - — Pulse power and directed energy weapons
- **Improved export-power capabilities**



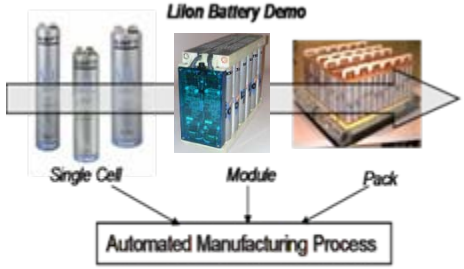
Energy Storage Investment Strategy

Current Systems

Current Technology

Advanced Lead-Acid

Capacitors for EMA



Testing

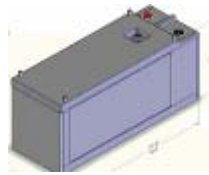
Future Systems

Improvements

Li-Ion Prismatic Cell

L-i-Ion Battery Module (50V)

NiZn Cell



Li-Ion / Ultracap Hybrid Energy Storage

LFP cathode

Efforts Supporting Current Force

- Battery Monitoring Technology development & testing
- Advanced Lead acid battery testing & qualification
- Advanced Lead Acid Battery Technology
- Enhancement
- *Battery Ballistic Impact Test & Evaluation*
- Battery Pack Integration, Testing & Evaluation

Efforts Supporting Future Force

- *High Power High Energy Li-Ion Battery Manufacturing*
- Large format Li-Ion prismatic cells with integrated liquid cooling development
- Lithium-Iron Phosphate Battery Safety Improvements
- Ultra High Power Li-Ion Cells for *Pulse Power*
- *Thermal Runaway Studies*
- Battery Pack Integration, Testing & Evaluation
- Nickel Zinc Battery Development

Advanced Batteries are the foundation for hybrid vehicles and technologies

Energy Excellence

Alternative Fuels Program

Fuel Evaluations

- Chemical composition
- Physical properties
- Fuel system impacts

System Evaluations

- Fuel-system interactions
- System performance and durability
- Fuel specification inputs
- Suitability of fuel for use in Army equipment

Engine Evaluations

- Fuel ignitability
- Fuel combustion
- Performance / durability

Alternative Fuel Vehicles & Infrastructure

SANGB Hydrogen Filling Station

Advanced Mobile Microgrid

Domestic Manufacturing Capability

Dual use Applications

Advanced automotive batteries - Enabler of alternative energy

Cells **Modules** **Packs**

State-of-the-Art Robotic Technologies

GM

Ford

U.S.ARMY

"The future of the auto is bright and increasingly electronic. Autonomous driving means that someday you could do your email, eat breakfast, do your makeup and watch a video while commuting to work".

Rick Wagoner, CEO GM, Consumer Electronics Show 2008 Keynote address stating that GM plans to test driverless cars by 2015 and have them in production by 2018.

Robotic Technologies

Technology Components

Integration

Demonstrators

Gladiator

Robotic Decontamination

RF Stryker

TAGS-CX

SME Defined Scenarios

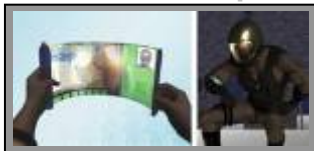
Military Relevant Test & Experimentation

Robotics Collaboration and RVCA ATO Experimentation

Convoy Active Safety Technologies (CAST)

Tech Transfer

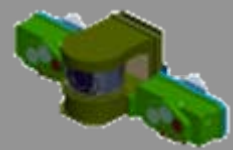
Transition and Requirements Development



Future Force SMI

FCS JTRS

FCS MULE



FCS ANS

Current Force Convoy Operations

Integration Technology Development Lessons Learned to Enable Early Technology Insertion

Tying in Commercial Automotive Safety Research

GM

TOYOTA

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Convoy Active Safety Technologies (CAST)

Jointly Funded by OSD JGRE and JCR

Program Goals:

- Provide low cost ($10-20K) convoy automation (Leader/Follower) capability for current force Army vehicles
- Support Warfighter requirement for convoy automation and active safety
- Provide Robotics capability in CS/CSS community
- Leverage RF, RDECOM and other FCS Technologies

Enhanced Soldier Protection

- Increased Situational Awareness
- Reduced Collisions
- Reduced Crew Driving Tasks
- Reduced Fatigue
- Increased Driver Cognition

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Joint Center for Robotics Efforts

- S&T Support to the RS-JPO
- Develops and Fosters external Relationships
- Matures technology for Insertion into ATO programs
- Robotics Outreach
- RS JPO Collaboration Cell Lead
- Support to IGS Capability Cells
- Robotics Academic Programs (Including Curriculum Development)

Government Partnerships	Industry Partnerships	Academia Partnerships	Community Outreach
TRADOC			TARDEC Robotics Quarterlies Robotics, Engineering and Technology Days

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Let's Start Early

Robotics, Engineering and Technology (RET) Days

- **Students gain insights into technology careers, math & science.**
- **Robotics is a multi-disciplinary field (electrical, mechanical & computer engineering).**
- **Supports Michigan's objective to be a technology based economy**

Michigan Robotics FIRST Support

- **3 Michigan Regional Competitions in 2008**
  - Provided VIP Speakers
  - Provided Technical Judges
- **TARDEC engineers serve as mentors to several metro-Detroit area high schools**
- **Future Activities:**
  - 2009 Michigan Regional Sponsorship
  - Assisting in building arenas for regional competitions
- **2009 – International Competition**

Intelligent Ground Vehicle Competition (IGVC)

- **University Engineering education challenging students to design autonomous vehicles**
- **16 Competitions since 1993**
  - Thousand of Students
  - 332 Teams
  - 67 University
  - 4 Countries (Canada, India, Japan, and Mexico)

Recruiting for Success

Summer Hires:

- 20 Colleges, 53 Students
- 15 High Schools, 15 Students
- 2008 10% of Summer Hires converted to Co-op Program

Projects:

- Survivability Material Processes & Ceramics Analysis
- Manipulator Arm Training for Walking Robot Prototypes
- Diesel Engine Simulations & Analysis

TARDEC's 2008 Summer Hire Expo

47 Projects 68 Students

Co-Ops & Interns

- 2001-2006 more than 85% of TARDEC workforce recruited from co-op program
- 51 Co-Op Positions as of Sep 08
- 17 AMC Interns
- 95% Retention rate
- 18 Local University Memorandums of Understanding
- In 2007 126 TARDEC associates participating in higher education
  - — 78% focused on emerging technology & global leadership curriculums

The Honorable Governor Jennifer Granholm &
The Honorable Senator Carl Levin
Touring the 2008 Summer Hire Exposition

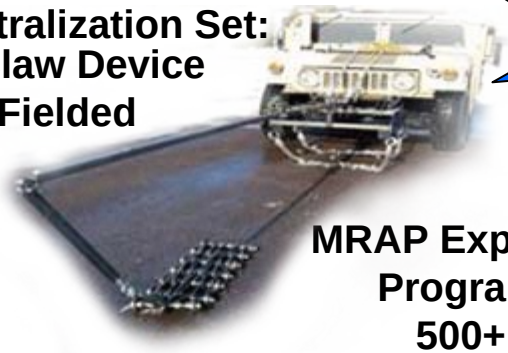
Contributions to the Global War on Terrorism

Life-Saving Solutions

2007 Army's Greatest Inventions Winner

SPARK Mine Roller 360+ Fielded

Wire Neutralization Set: Wolf Claw Device 10 Fielded

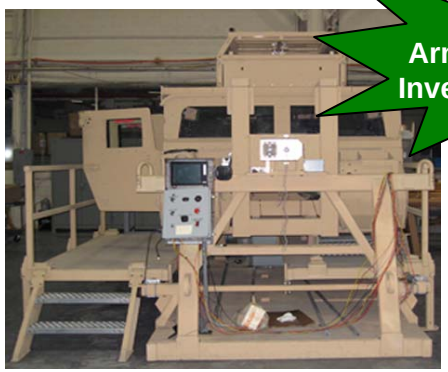


2008 ASA (ALT) Collaboration Award Winner

2008 Army Acquisition Excellence Award Winner

MRAP Expedient Armor Program (MEAP) 500+ Fielded

2007 Army's Greatest Inventions Winner



HMMWV Egress Assistance Trainer (HEAT)

Additional Life-Saving Solutions

- Vehicle Expedient Armor
- M939 Crew Protection Kit (CPK)
- All Terrain Armored Cab
- Interim High Mobility Engineering Excavator (IHMEE) Advanced Crew Protection Kit
- Tactical Vehicle Add-on-Armor (AoA)
- Construction Vehicles AoA
- Fuel Tank Fire Protection
- HMMWV Automatic Fire Extinguishing System (AFES)
- M1114 HMMWV Motorized Turrets
- Omni-Directional Inspection System (ODIS)
- Weapon Systems Mapping Software (WSMS)
- Wolf Collar and Tail Wire Neutralization Set

Getting the Right Technologies to the Warfighter Quicker

RDECOM

The Hub of Innovation & Integration

TARDEC

DoD's Ground Vehicle Center of Excellence

Tactical Fuel Logistics & Protection

Kuwait/OIF/OEF Fuel to FOB (Million gallons/yr)…… **431**

Fuel trucks needed……140,075

Convoys needed…… 9,332

Soldiers per convoy trip
(Fuel trucks, protection, other support)…… 120

Soldier Convoys…… 644,360

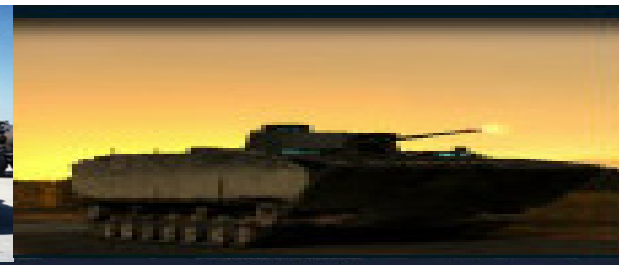
Fewer Soldier Convoys…… 6,444
(Resulting from 1% Fuel Savings)

Source : Report of the Defense Science Board Task Force on DoD Energy Strategy "More Fight – Less Fuel" published Feb. 2008

MARINE CORPS SYSTEMS COMMAND

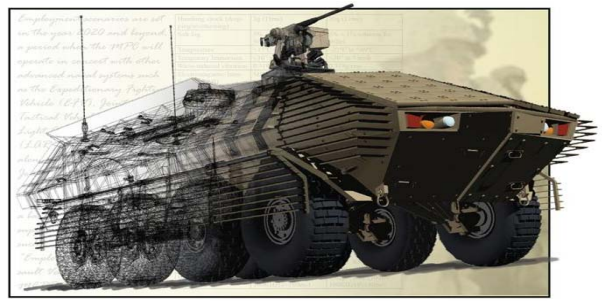
EQUIPPING THE WARFIGHTER TO WIN

Combat Vehicles Conference
Marine Corps Systems Command
21 October 2008



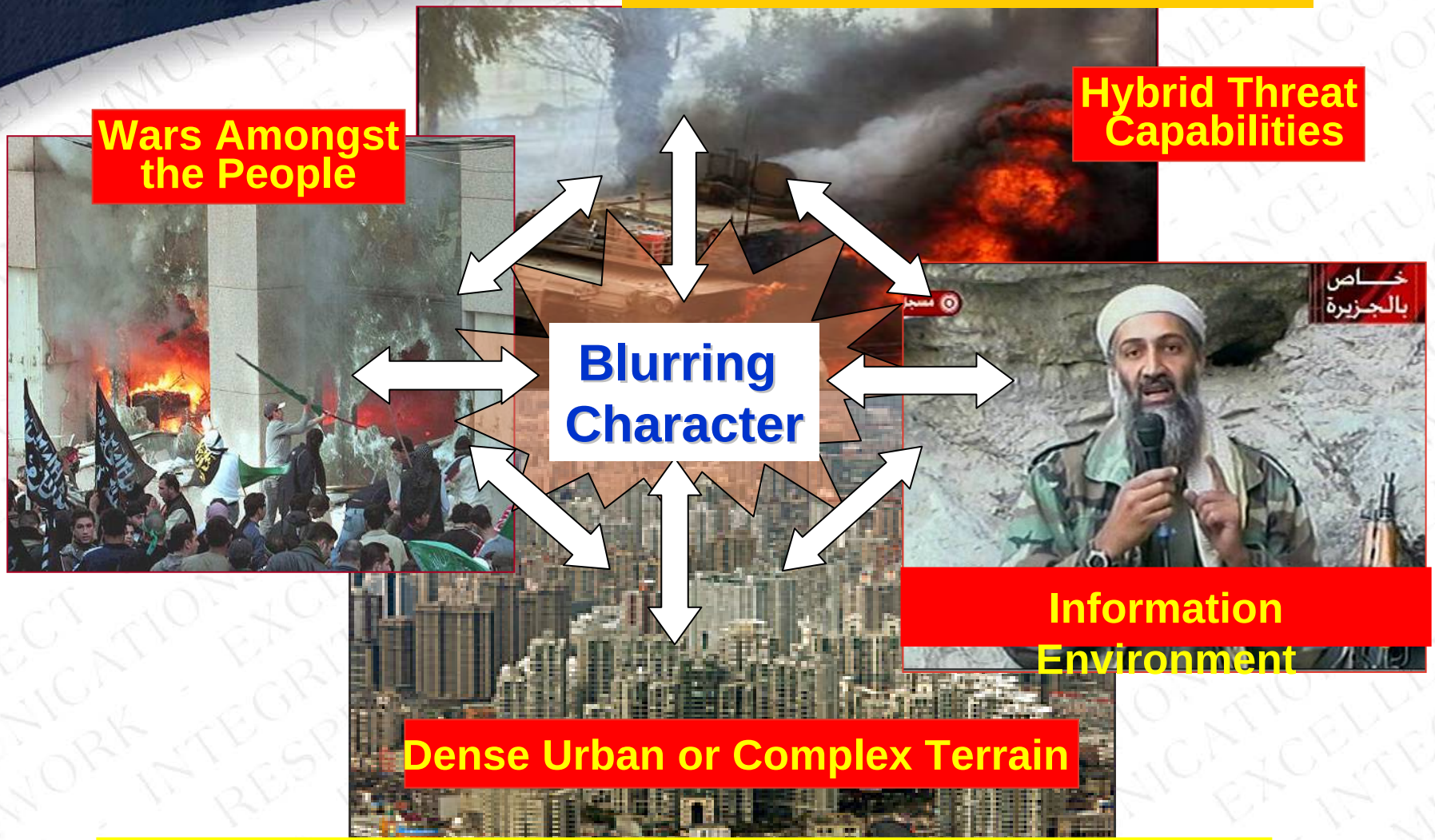
Brigadier General Michael M. Brogan

Responsibility



MCSC		PEO LS
•LAV	Replaced By	• --- ---
•AAV	Replaced By	•EFV, MPC
•Tank	Replaced By	• --- ---
•HMMWV/ECV •MRAP	Replaced By	•?JLTV?

Complex Operational Environments



Hybrid threats exploit the complex terrain of the urban littoral to maximize their disruptive capacity

Blurring The Lines

Combat Vehicles

- LAV
- AAV
- Tank

Tactical Wheel Vehicles

- HMMWV
- MTVR
- LVS

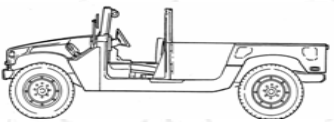
MRAP



HMMWV Timeline

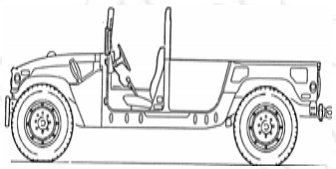
Planned fielding of JLTV

1984 — First HMMWV Fielded to fleet



M998 / M1038

1998 — HMMWVA2 fielded

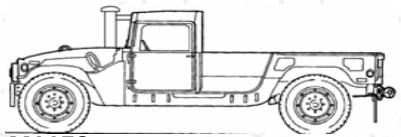


M1097A2

2003 — M1114 fielded

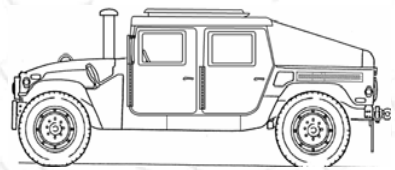
M1114

2006 — M1151/M1152 produced



M1152
2-dr w/ A/C
MRC / Shelter or Troop Carrier

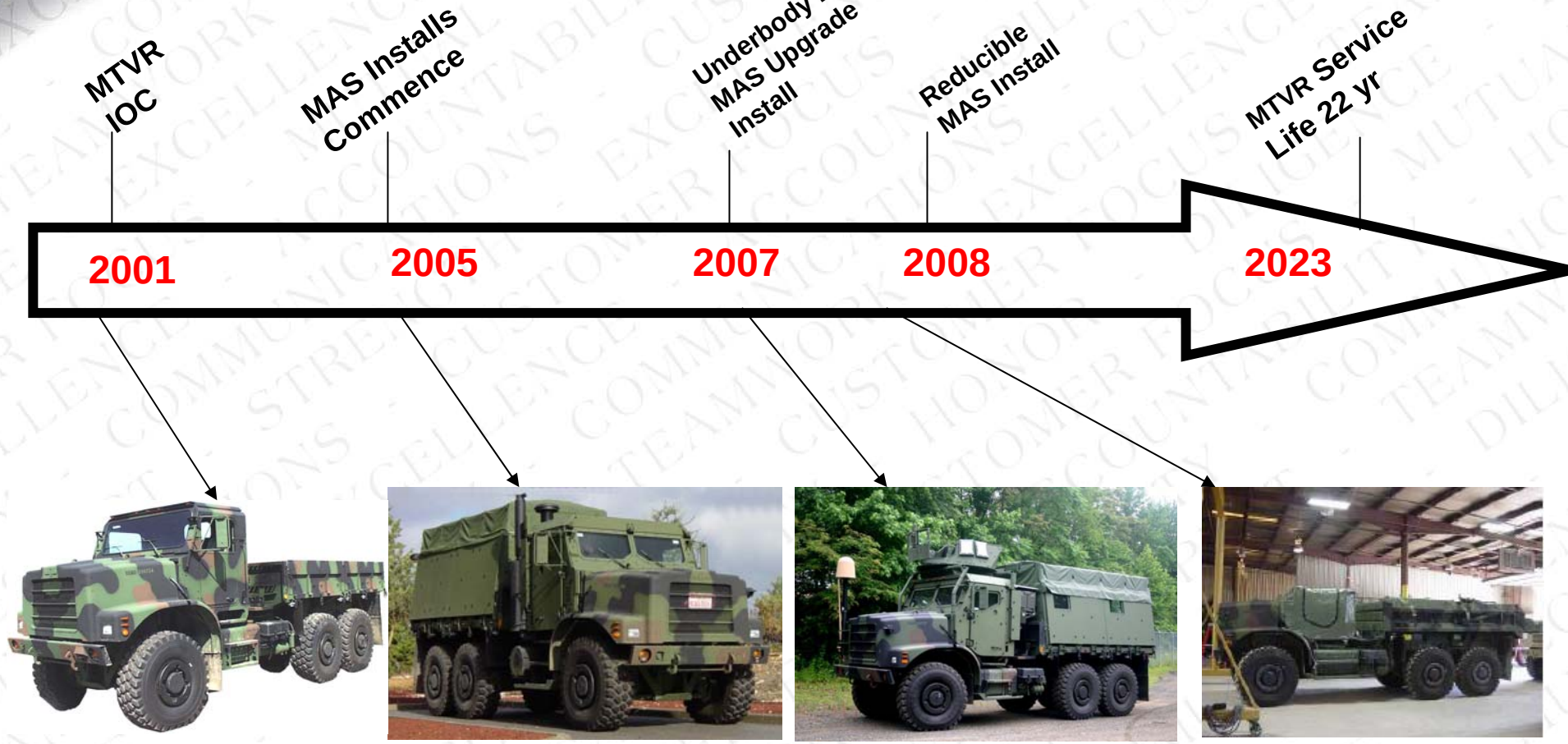
2012



M1151
4-dr w/ A/C
Armament Carrier

HMMWV Today

MTVR Armor System Timeline



MTVR Today

LVS Timeline

1984 1993 2006 2009 2012

LVS Fielding

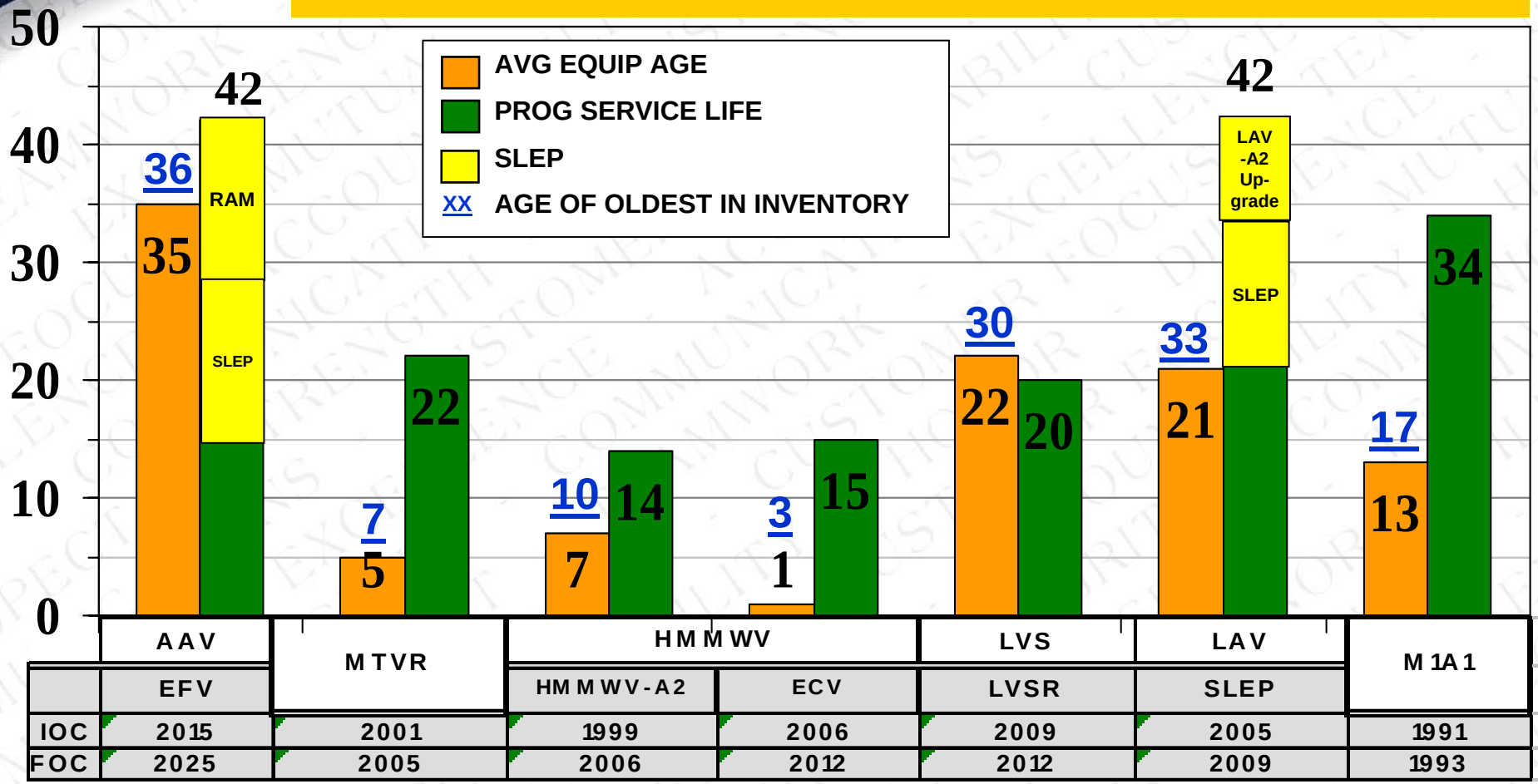
LVS A2 Fielding

LVS MAK I

LVS MAK II

LVSR Fielding

SELECTED GROUND EQUIPMENT AGING



	AAV	MTVR	HMMWV		LVS	LAV	M1A1
	EFV		HMMWV-A2	ECV	LVSR	SLEP	
IOC	2015	2001	1999	2006	2009	2005	1991
FOC	2025	2005	2006	2012	2012	2009	1993

Marine Corps Challenges

- Funding
- Timing
- Expeditionary

Industry Challenge

- Requirements
- Funding
- RAM

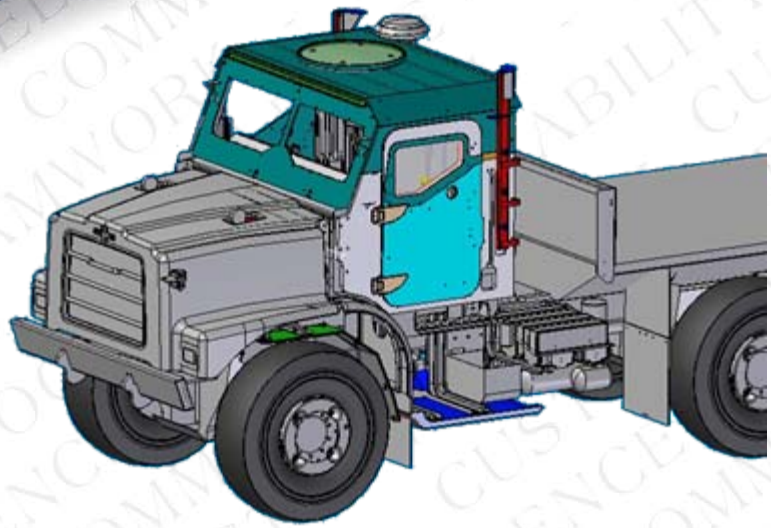
Questions

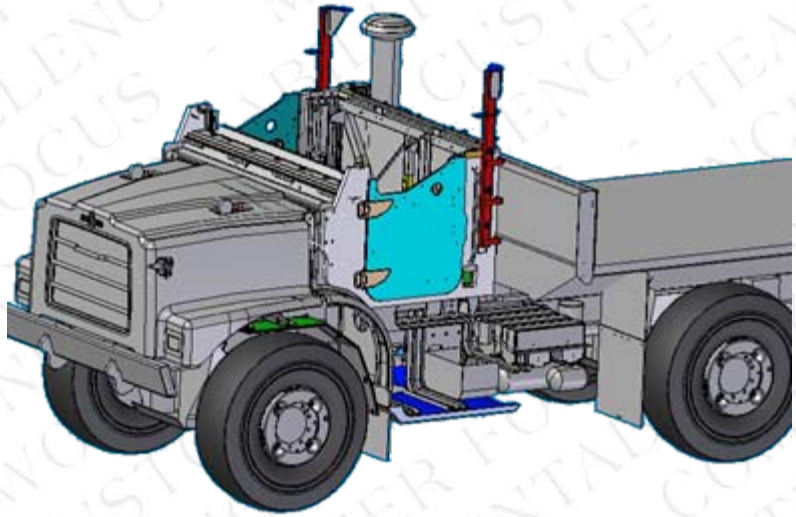
Back-ups

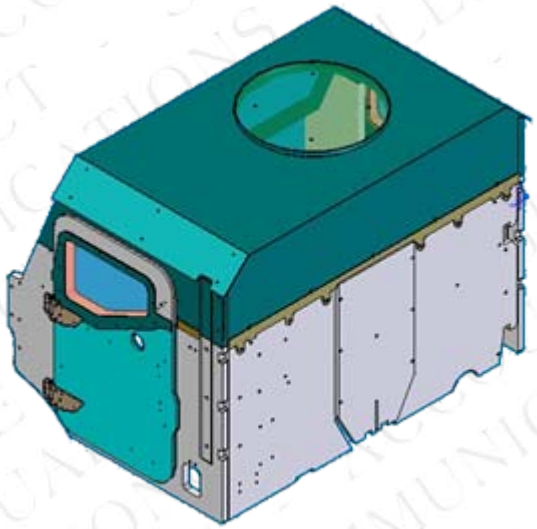
MRAP All Terrain Light Combat Vehicle

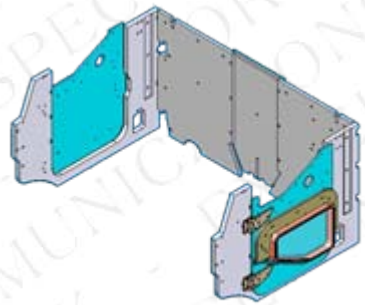
- Mobility and Protection

Reducible MAS



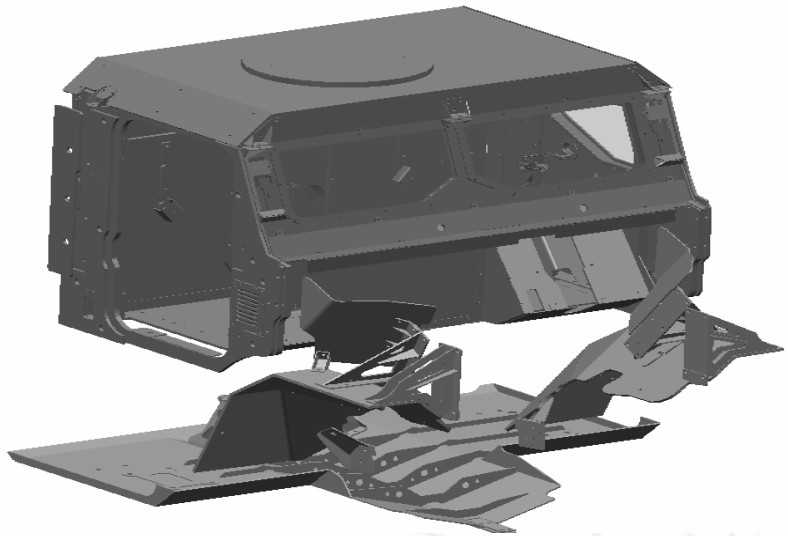


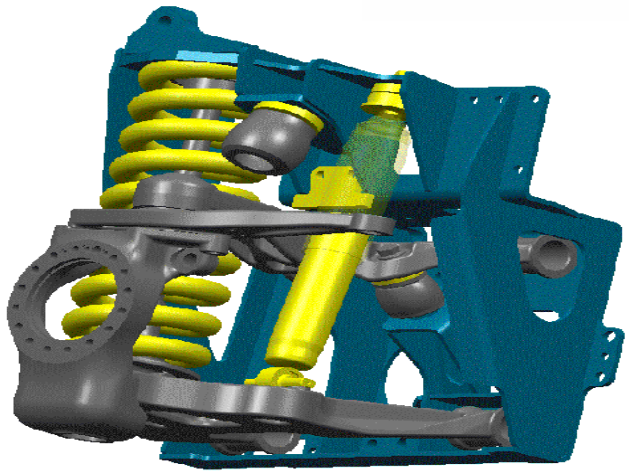




UNCLASSIFIED

MTVR Blast Protection Upgrade (UUNS - 06303UB)





EXPEDITIONARY FIGHTING VEHICLE (EFV)

National Defense Industrial Association (NDIA)

Combat Vehicle Division Conference

21 Oct 08

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

Revolutionizing Expeditionary Maneuver Warfare

Present: AAV

- WWII Doctrine
- No Standoff Distance for ATF
- Slow Speed Amphibious Assault
- 1960's Technology
- Limited Survivability

Future: EFV

- EFV directly supports the Marine Corps' Capstone Concept: Expeditionary Maneuver Warfare
- The EFV will provide the tactical mobility asset required to spearhead the EMW concept and permit the Marine Corps to fully exploit littoral areas as maneuver space
- The EFV will allow immediate, high speed maneuver of Marine infantry units as they emerge from ships located beyond the horizon (25 nm and beyond)
- The EFV's unique combination of offensive firepower, armor, NBC protection, and high speed mobility on land and sea represent major breakthroughs in the ability of Naval and Marine expeditionary forces to avoid an enemy's strength and exploit its weakness

Leap Ahead to 21st Century Technology

EFV

Mission Essential Functions

Move (Land)

Move (Water)

Shoot

Communicate

Carry

Protect

EFV - KEY PERFORMANCE PARAMETERS

CRITERIA	THRESHOLD	OBJECTIVE
• **High Water Speed** - 2'significant wave height, for not less than one 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**	100% of Critical *IERs	100% of Top Level *IERs

***** Information Exchange Requirements (IERs)

Currently Demonstrated Plan to Demonstrate

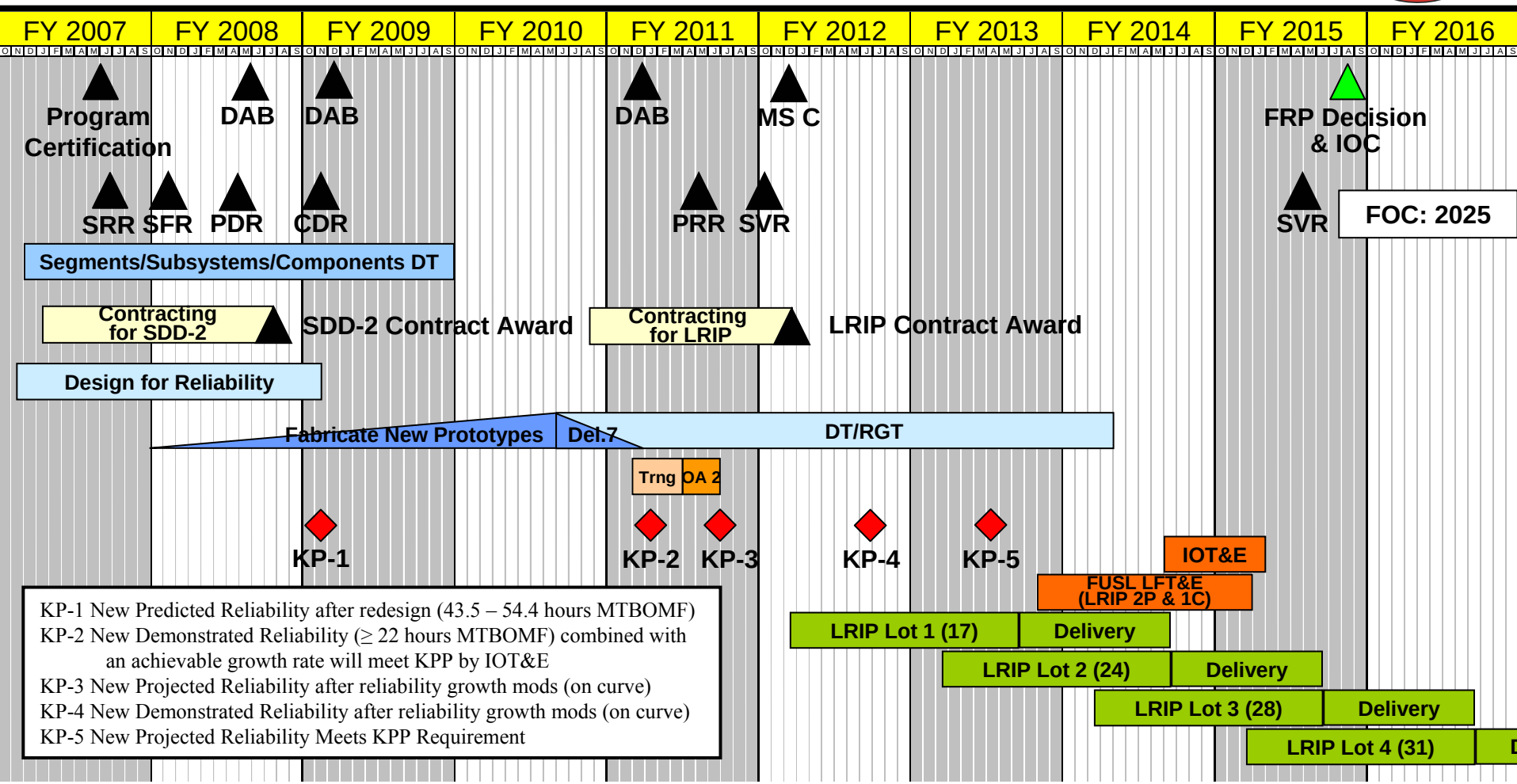
PROGRAM UPDATE

SIGNIFICANT EVENTS

- System Requirements Review (SRR) completed 28 Jun 07
- System Functional Review (SFR) completed 11 Dec 07
- DFR Contract Mod Definitized 17 Jan 08
  - 51 Mission Essential Components included
  - Fault Tree Model continues to predict a design of 60.7 hrs Mean Time Between Operational Mission Failure (MTBOMF)
- System Software Review (SSR) conducted 28 Feb 08
- Capstone Preliminary Design Review (PDR) conducted 2 May 08
- Systems Development & Demonstration - 2 (SDD-2) Defense Acquisition Board Review conducted 30 May 08
- SDD-2 Contract awarded 31 Jul 08
- Component Design Review (CDR) Nov 08
- Integrated Baseline Review (IBR) Jan 08

PROGRAM UPDATE

13 AUGUST 2007 EFV PROGRAM STRUCTURE



KP-1 New Predicted Reliability after redesign (43.5 – 54.4 hours MTBOMF)
KP-2 New Demonstrated Reliability (≥ 22 hours MTBOMF) combined with an achievable growth rate will meet KPP by IOT&E
KP-3 New Projected Reliability after reliability growth mods (on curve)
KP-4 New Demonstrated Reliability after reliability growth mods (on curve)
KP-5 New Projected Reliability Meets KPP Requirement

Prior Yrs	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	(Millions)
2,078	244	316	212	189	174	88	77	51	RDT&E
186	0	0	0	70	484	598	614	680	PMC
1	0	0	0	0	17	24	28	31	Quantity

Program Efforts Leading To MS C

- **Redesign for reliability**
  - Instituting robust systems engineering processes
  - Extensive segments/subsystems/components developmental testing
- **Build new prototypes**
  - Prototypes will be fabricated as parts "earn their way in" through the design release/verification process
- **Conduct extensive testing on new vehicles**
  - Developmental Testing and Reliability Growth Testing
  - Confirmation program is on reliability growth curve
  - Operational Assessment to support Milestone C

SDD-2 PROGRAM GOALS

- **Reduce Vehicle Weight**
- **Reduce Vehicle Cost**
- **Improve Vehicle Performance**
- **Improve Vehicle Reliability, Availability, Maintainability, Durability (RAM-D)**
- **Introduce New Warfighting Capabilities**

PROGRAM OBJECTIVES

- **Emphasize near term technology, but anticipate for future upgrades through production and fielding.**
- **Reduce Vehicle Weight**
  - Lighter Weight Track
  - Lighter Weight Armor
  - Material Substitution
- **Reduce Vehicle Cost / Life Cycle Cost**
  - Identify Substitute Line Replaceable Units
  - Improve Manufacturing Processes
  - Improve Logistic Support Programs

PROGRAM OBJECTIVES

- **Improve Vehicle Performance**
  - Improve Power Transmission
  - Increase Armor Protection
- **Improve Vehicle RAM-D**
  - Corrosion Prevention
  - Robustness
- **Introduce New Warfighting Capabilities**
  - Wireless Technology
  - Advanced Displays
- **Introduce Design Enhancements**
  - Dissimilar Metal Avoidance
  - Modeling & Simulation of Battle Damage

Small Business Innovation Research Program Initiatives

- **Reduction of Ground Vehicle Observables**
  - Reduce the vulnerability of ground vehicles to detection and weapon-targeting systems
- **Blast and Impact Resistance of Polyurea Coatings on Metallic and Non-Metallic Materials**
  - Research, develop and characterize polyurea materials ability to increase blast and fragment protection
- **Directional High Flow Ballistic Exhaust Grille**
  - Research, design and build a high flow rate ballistic exhaust grille that allows directional output control

Small Business Innovation Research Program Initiatives

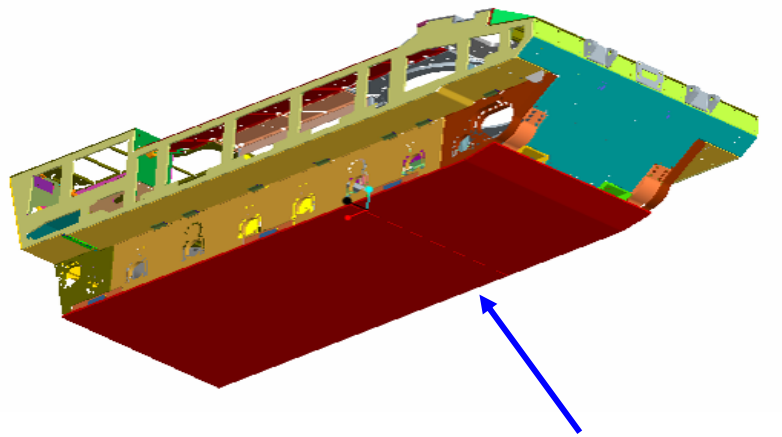
- **Low Cost, Low Weight, Self-Sealing Fuel Tank Technology Development**
  - Conduct research in self-sealing fuel tank technology and the development of an integrated material solution that is low cost, rugged, lightweight, and non-flammable; solution will enable vehicle operation in hostile environments and minimize loss of fuel due to a direct / indirect hit
- **Air Flow Noise Reduction Techniques**
  - Develop techniques to reduce engine cooling system noise levels to mitigate the potentially adverse health affects on crew members

Small Business Innovation Research Program Initiatives

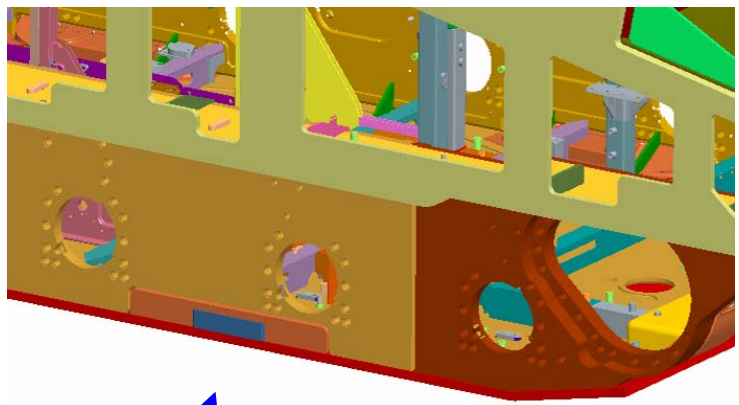
- SBIR Point of Contact is
  - Craig Harvey Program Manager, Advanced Technology
  - (703) 780-2458

OTHER INITIATIVES

- Appliqué Armor Kit
  - Provides Mine Blast Protection for Extended Land Operations
  - Belly/appliqué integration has minimal impact on reliability, production, Land Operation Modes
  - Reduced Water Mode Capabilities



Appliqué kit



Appliqué kit attaches to existing features on the vehicle

PROGRAMMABLE AIRBURST MUNITIONS (PABM)

B004
MK310

ATK HEAB

FY08	FY09	FY10	FY11	FY12	FY13
• PABM qual effort (1200 rds)		• RDT&E PABM buy (4000 rds) /$3.6 mil purchased		Unfunded	
• PABM system integration (2520 rds)					
				• SDDII vehicle integration	

- PM AAA is the lead in a joint (US Army, Navy & USMC) effort to qualify PABM round
- Testing and lethality modeling prove 30mm AB Munitions have 4-6 greater lethal effects against Infantry and light to medium material targets
- Approximately eight 30mm AB rounds as lethal as a 155mm round
- The significant increase in lethality provided by the 30mm PF/AB round will provide ~$10M cost savings over the Life Cycle
- PABM efforts currently on hold due to lack of funding

Note: Our CPD requirement is – 1 EFV will take out a MRPlatoon (T), take out a MRCompany (O). MPLD/HEI meets the threshold requirement, PABM gets us closer to the objective requirement


www.efv.usmc.mil

2008 TACOM LCMC Combat Vehicles Conference

"Urgent Need Today for Tomorrow's Capabilities"

TACOM LCMC

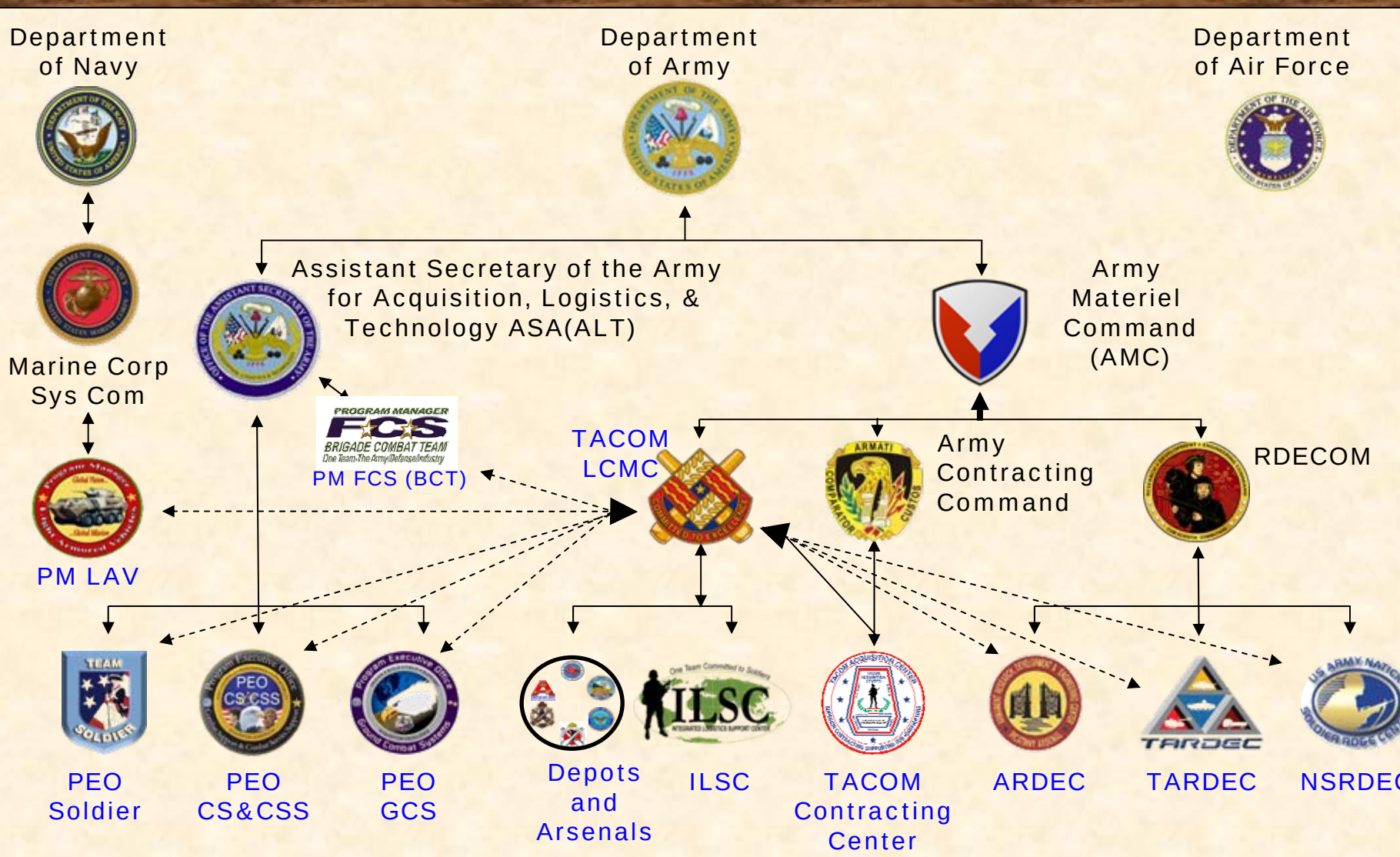
Mr. Jack Dugan
TACOM LCMC Deputy to the Commander

21 October 2007

Skill & Experience

Why We Do What We Do

TACOM LCMC


Department of Navy
Department of Army
Department of Air Force
Marine Corp Sys Com
Assistant Secretary of the Army for Acquisition, Logistics, & Technology ASA(ALT)
Army Materiel Command (AMC)
PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
PM FCS (BCT)
TACOM LCMC
Army Contracting Command
RDECOM
PM LAV
PEO Soldier
PEO CS&CSS
PEO GCS
Depots and Arsenals
ILSC
TACOM Contracting Center
ARDEC
TARDEC
NSRDEC

TACOM LCMC…What We Do

MISSION: Develop, acquire, field, and sustain Soldier and ground systems for the Warfighter through the integration of effective and timely Acquisition, Logistics, and cutting-edge Technology

Core Competencies:

- Acquisition / Program Management
- Logistics, Industrial Operations, and Contracting
- Research, Development, and Life Cycle Engineering

The Magnitude:

- Over 70% of the Military's Equipment / Systems
- Over 150 Allied Countries Own Our Equipment
- Nearly 3,000 Fielded End Items
- Approximately 37,000 Components
- Nearly 500,000 PLISNs

The TACOM LCMC Product Lines:

- Combat Vehicles
- Trailers
- Materiel Handling Equipment
- Fuel & Water Dist Equipment
- Chemical Defense Equipment
- Howitzers
- Commercial Vehicles
- Tactical Vehicles
- Construction Equipment
- Tactical Bridges
- Armored Security Vehicle
- Route Clearing Vehicle
- Mine Resistant Ambush Protected (MRAP)
- Sets, Kits & Outfits
- Shop Equipment
- Large Caliber Guns
- Watercraft
- Mortars
- Aircraft Armaments
- Rail
- Fuel & Lubricant Products
- Rifles / Machine Guns
- Soldier Equipment
- Rapid Fielding Initiative
- Robotics

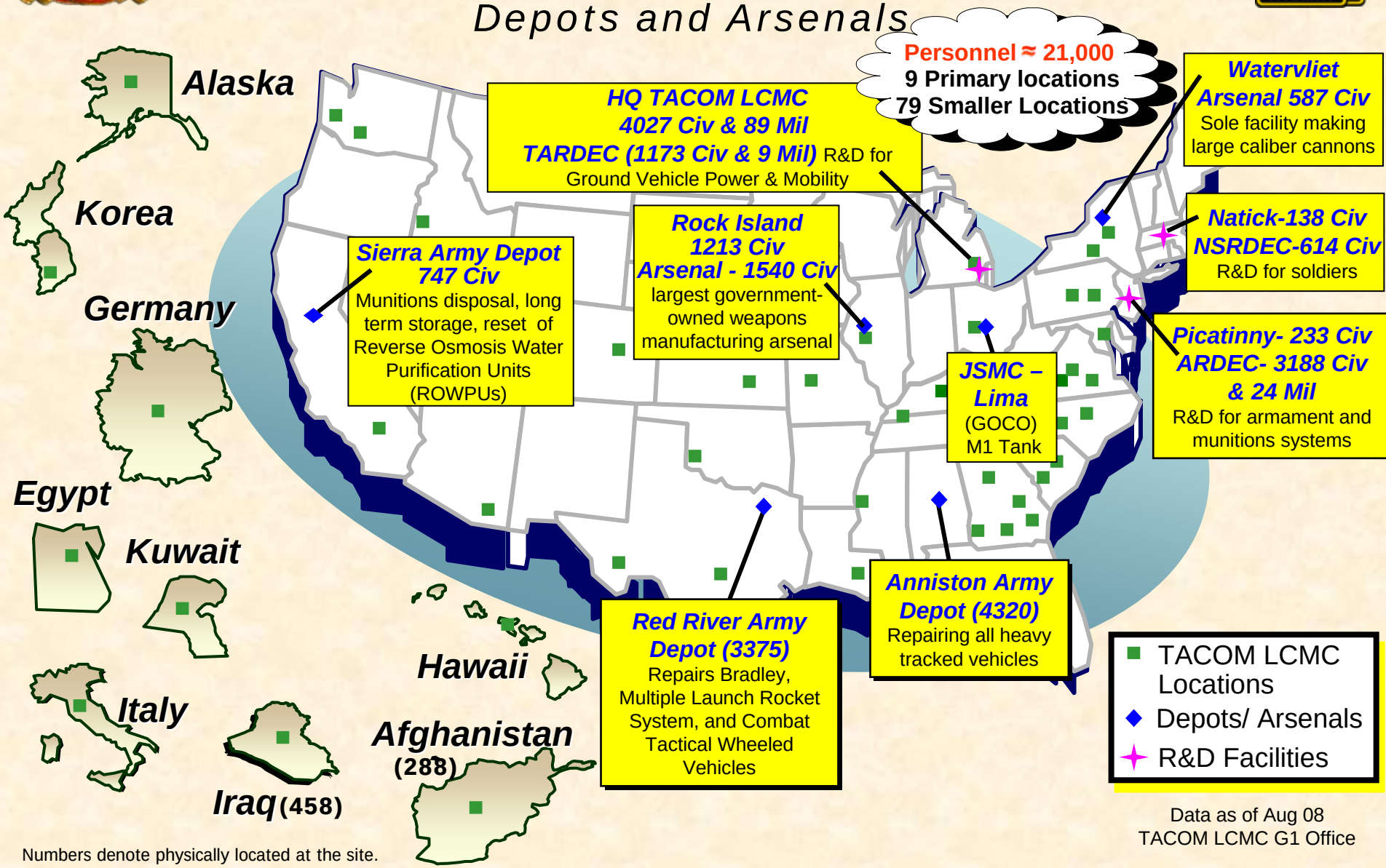
We support a diverse set of product lines through their life cycles, from combat and tactical vehicles, armaments, watercraft, fuel and water distribution equipment, to soldier, biological, and chemical equipment.

TACOM LCMC Organizations and Our Life Cycle

Joint Warfighter Reqmts → Concept Refinement → Technology Development → System Development and Demonstration → Production and Deployment → Sustainment and Upgrade → Removal from Inventory

Where We Are

TACOM LCMC Associates Depots and Arsenals



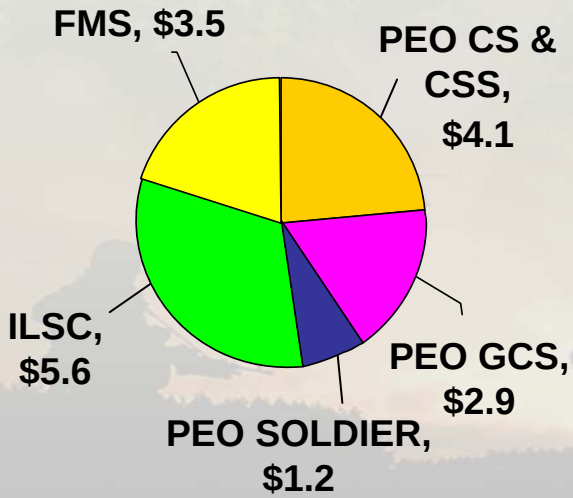
Numbers denote physically located at the site.

Data as of Aug 08
TACOM LCMC G1 Office

TACOM LCMC

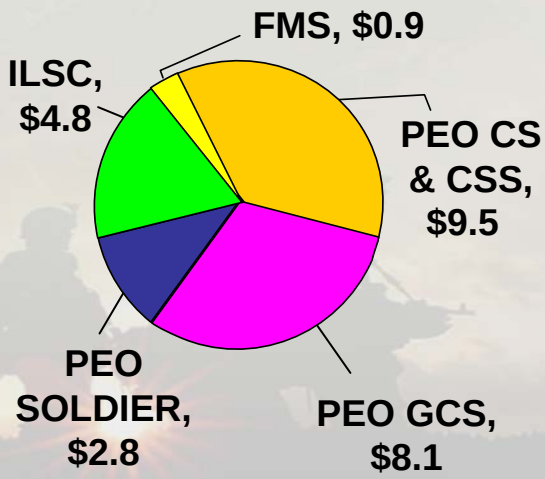
FY08 Total Command Obligations

Base Program



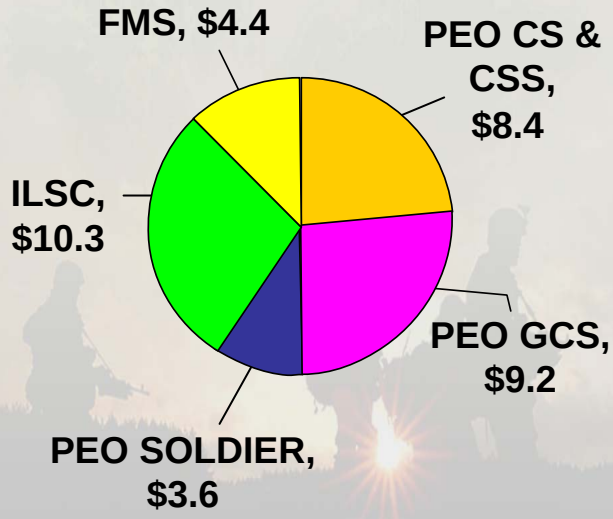
$17.3B

Supplemental Program



$26.1B

Obligations



$36.0B

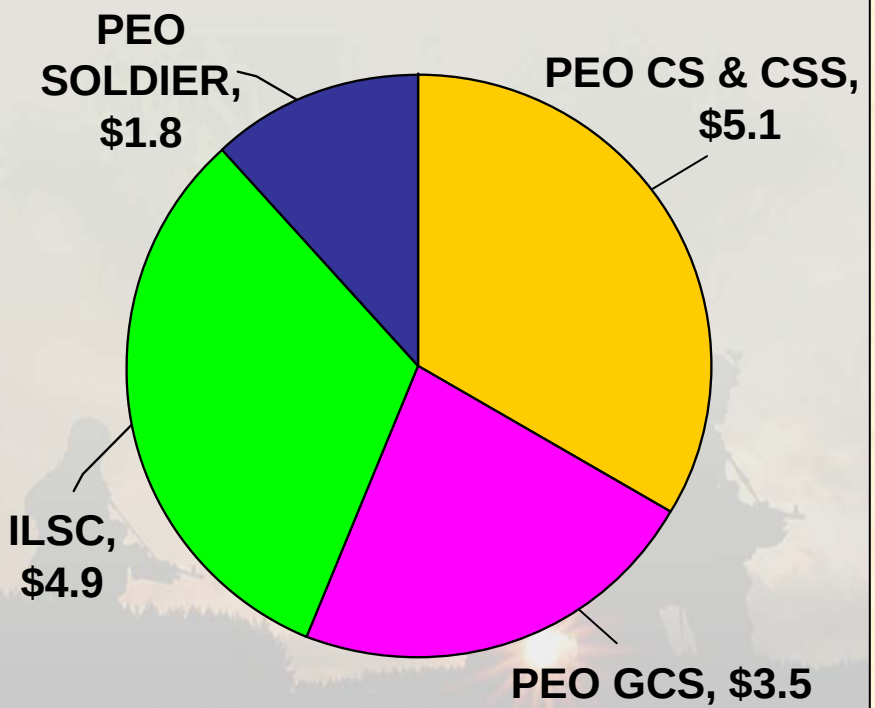
TOTAL FY08 CONTRACTS: $30.5B

Includes $'s from customers outside TACOM LCMC

TACOM LCMC
FY09 What We Think

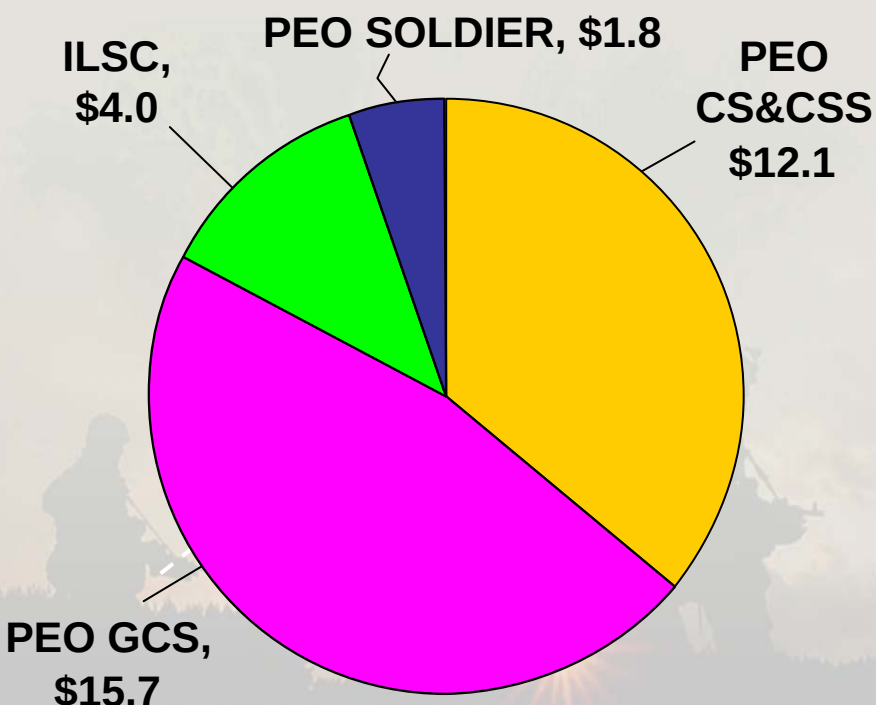
($B) ***FY09 Total Command Budget $48.9B (estimated)*** ($B)

Base Program



$15.3B

Estimated Supplemental

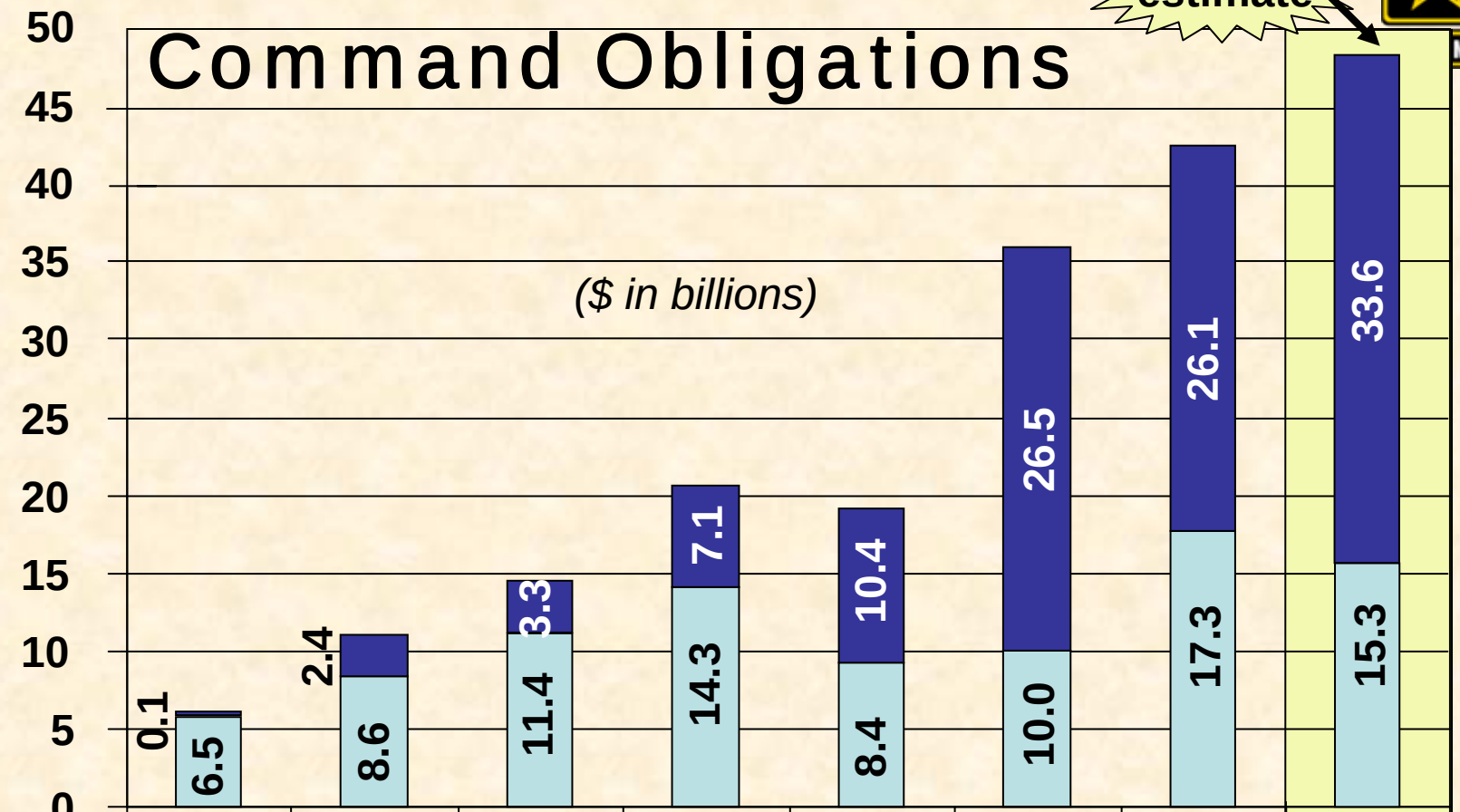


$33.6B

TOTAL Estimated FY09 Contract Awards: $27.9B

Total TACOM LCMC Command Obligations

FY09 estimate



	2002	2003	2004	2005	2006	2007	2008	2009
SUPP	.1	2.4	3.3	7.1	10.4	26.5	26.1	33.6
Base	6.5	8.6	11.4	14.3	8.4	10.0	17.3	15.3
Total	6.6	11.0	14.7	21.4	18.8	36.5	43.4	48.9
Base as % of Total	98%	78%	78%	67%	45%	27%	40%	31%

Base SUPPLEMENTAL

Funding Within the Life Cycle

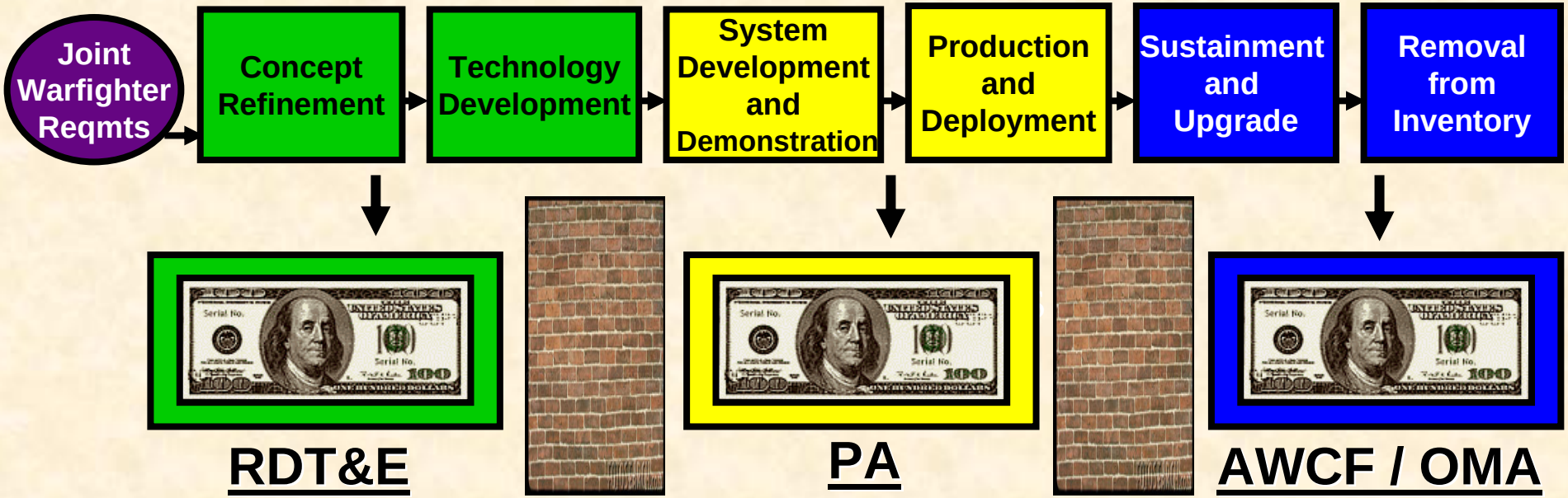
Joint Warfighter Rqmts → Concept Refinement → Technology Development → System Development & Demonstration → Production & Deployment → Sustainment & Upgrade → Removal from Inventory

RDT&E

APA/OPA

AWCF / OMA

LCMC TRANSFORMATION CHALLENGE

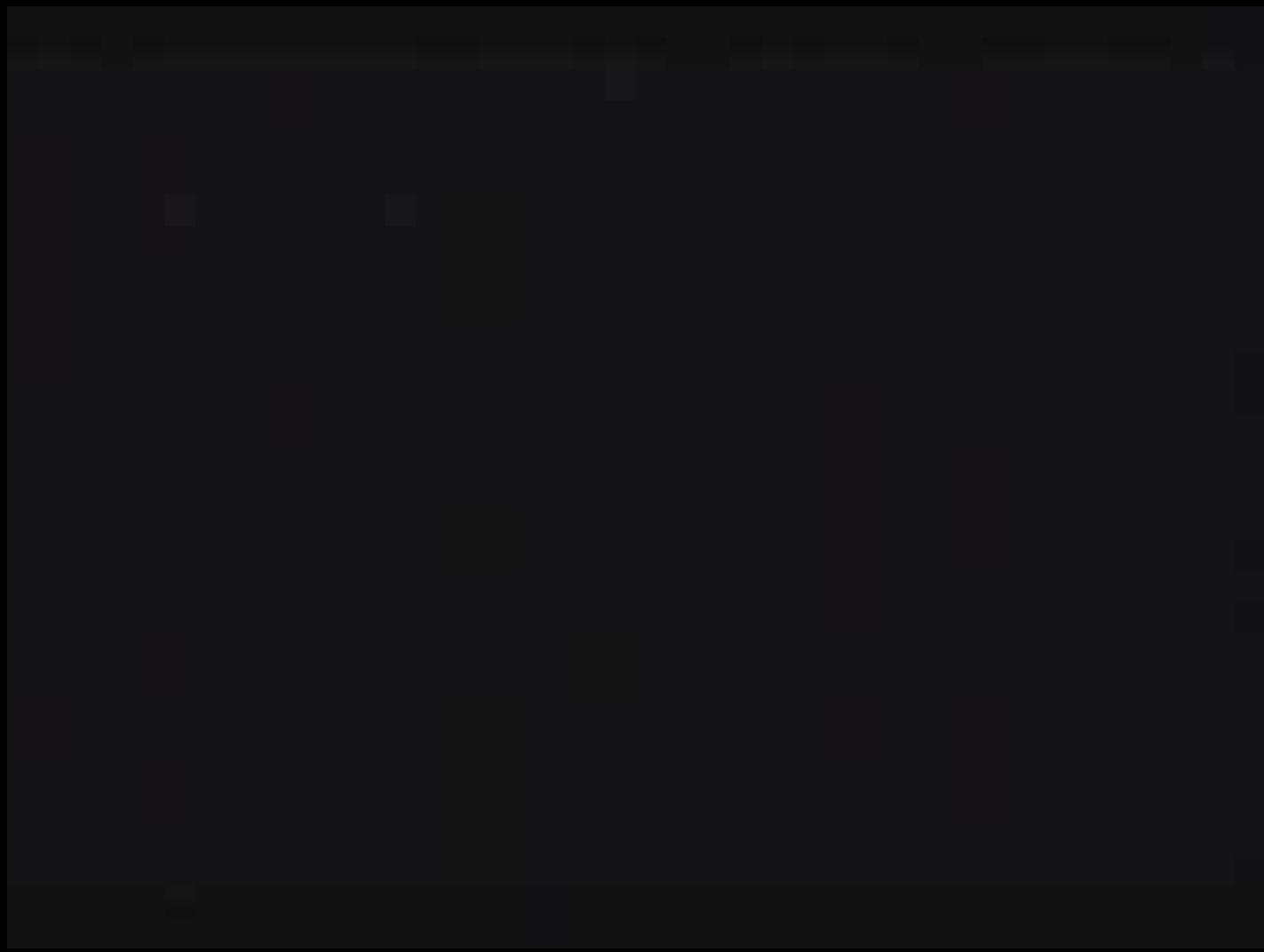


- **CONCEPTUAL BARRIERS**
- **FINANCIAL BARRIERS**
- **POLICY BARRIERS**
- **LEGISLATIVE BARRIERS**
- **CULTURAL BARRIERS**
- **ORGANIZATIONAL BARRIERS**

Partnering in End Items

Abrams AIM/SEP Tank GDLS ↔ ANAD	**Bradley Fighting Vehicle** BAE ↔ RRAD	**Stryker Battle Damage Repair** GDLS ↔ ANAD
HEMTT Reset Oshkosh ↔ RRAD	**FMTV Reset** BAE ↔ RRAD	**HMMWV Recap** AM General ↔ RRAD
MRAP BAE ↔ LEAD	**ASV** Textron ↔ RRAD	**FCS Cannon** GDOTS ↔ WVA

Urgent Need to Keep the Army Strong



America's Army

- We exist to support warfighters, and we will do what it takes to meet their needs

- We're a high tech, global organization. We are prepared for changes in threat, technology, and mission

- We're constanly working to increase the safety of our Soldiers

- Our programs are at the core of Army Modernization; failre to modernize is measured in lives

Captain Brian Gilbert – NDIA Combat Vehicle Conference

Background –

✓ 3 Separate Deployments in support of OIF.

⇨OIF I: 3rd ACR Troop XO (Bradleys)

⇨OIF III: 1-15 IN, 3HBCT, 3ID: AS3 (M1114)

⇨OIF V: D/1-15, 3 HBCT, 3ID: Tank Company Team Commander (M1, M2, MRAP, M1151)

✓ OIF V:

⇨3 HBCT, 3ID Task Organization: 1xCAB, 1xRISTA Squadron, 1xArtillery BN, 1xGG BN, 1xBSB, 1xBSTB

⇨Company Team Consisted of 1xTank Platoon, 1xInfantry Platoon, 1xScout Platoon, 1xMortar Platoon.

⇨Company operated out of a combat outpost located in the city of Jisr Diyala. Approximately 3km southeast of Baghdad. Population approx. 200,000.

⇨Company AO consisted of both urban and rural terrain. Rural terrain was extremely diverse ranging from Unrestricted – Severely Restricted. Specifically along the Tigris River.

Company Area of Operations: March 07 – May 08

Brigade Mission

3 HBCT conducts Full Spectrum (FSO) ICW Iraqi Security Forces (ISF) and Sons of Iraq (SoI), to interdict accelerants IOT deny extremist elements freedom of movement from the Mada'in Qada into Baghdad and prevent sectarian violence.

Company Missions

1. **Secure LOCs/Deny Accelerants into Baghdad**
2. **Secure Population**
3. **Develop Sons of Iraq Groups**
4. **Capture/Kill Criminals/Terrorists**

Effects of The Brigade Operation

- ✓ EKIA: 160
- ✓ EWIA: 13
- ✓ # DETAINED: 602
- ✓ HVI'S KILLED OR DETAINED: 47
- ✓ IED'S FOUND/DETONATED: 197/137 FOUND RATE 59%..IED event every 1.3 days
- ✓ CACHES SEIZED:205
- ✓ BOATS DESTROYED: 172
- ✓ BATS/HIDES: 12,053
- ✓ BLDGS CLEARED: 3,892
- ✓ VEHICLES SEARCHED: 18,215
- ✓ TDF MISSIONS: 2615, fired over 7000 rds
- ✓ A company named operation…1 every 1.7 days…10,825 CBT Patrols…17,528 ISF patrols
- ✓ 15,000 jobs restored
- ✓ Increased water irrigation: 540%
- ✓ 500,000 dollars in small business grants
- ✓ 45 million in Cerp…468 projects
- ✓ 1 radio station built..81 Iraqi media events
- ✓ 750 Combat Logistics Patrols
- ✓ Over 60 sources developed…over 2,000 SIR, DIIR, and or Spot-reps
- ✓ Over 5,200 SUAV flights….1040 missions

Captain Brian Gilbert – NDIA Combat Vehicle Conference

Background Cont.

✓ OIF V:

⇨ MRAPs were primarily used when conducting operations on improved roads where deep buried IEDs were the main threat.

⇨The MRAP provided us the protection that the M1151 lacked while still giving us the mobility needed to operate in tight spaces and on roads that could not bear the weight of an M1 or M2.

⇨We conducted weekly route clearance on an improved road that bordered the Tigris River. This road historically had Deep Buried IEDs that were command detonated. Each side of the road was lined by palm groves and dense foliage. The MRAP obviously provided good protection but also the height for the Gunner to see into those palm groves to provide accurate and timely direct fire.

⇨Drawback to the MRAP was also the height due to low hanging wires throughout the AO. This caused us to make modification to the truck in order to push the wires out of the way of the gun turret.




Captain Brian Gilbert – NDIA Combat Vehicle Conference

Background Cont.

✓ OIF V:

⇨ With the infantry platoon the MRAP maintained the capability of the M2 as far as troop carrying ability. Although the Soldiers had some difficulty dismounting because of the height of the ramp we were still able to deploy dismounted Soldiers fairly quickly from this platform.

⇨ Because of the troop carrying capability we often used the MRAP during Raid operations in Urban environment when the threat of enemy contact was minimal and speed and surprise was essential. The MRAP is much more quiet than a Bradley and can easily act as a blocking vehicle on the inner cordon. Again the only concern was the low hanging wires because of the height of the vehicle.

⇨The final drawback to the MRAP was the suspension. Because of the tight suspension we rarely used the MRAP on unimproved roads. The vehicle seemed prone to roll overs in rugged terrain and at higher speeds the smallest pothole caused the vehicle to bounce.

Captain Damian M. Gill – NDIA Combat Vehicle Conference

Background –

✓Executive Officer: D-TRP/2-1 CAV/4th SBCT/2nd ID

✓Platoon Leader: Stryker NBC RV Operation Iraqi Freedom 2007-2008

✓Stryker NBC RV Fielding and IOT&E

Deployment OPERATION IRAQI FREEDOM:

- ⇨PLT Consisted of three Stryker NBC RVs
- ⇨A part of the RSTA Squadron, 2-1 Cavalry Regiment
- ⇨Operated out of FOB Warhorse, Diyala Province Iraq
- ⇨4th SBCT was the land owning unit for the Diyala Province, north east of Baghdad
- ⇨Responsible for cities of Baqubah, Muqadia, and Khalis
- ⇨Province of roughly 1.5 million persons
- ⇨Executed 14 months of combat operations that brought AQI to their knees

Captain Damian M. Gill – NDIA Combat Vehicle Conference

4th SBCT COMBAT OPERATIONS

✓ Conducted 14 months of continuous combat operations

✓Stryker Vehicles used as the primary weapon system for the BDE

✓Our SQDN used them as a mix of Infantry and Cavalry—arrive quickly, silently, dismount, attack and then destroy lethally

✓Notable involvements were the following:

- ✓Involvement with Operation Arrowhead Ripper (clearing of Baqubah)
- ✓Blackhawk Reaper (clearing of the canal area Hib Hib)
- ✓Blackhawk Harvest (opening of HWY-5, previously closed for 2 years)
- ✓Operation Justice League (clearing of northern Khan Bani Sa'ad)

Captain Damian M. Gill – NDIA Combat Vehicle Conference

OVERALL PERFORMANCE

- ✓ Fulfilled the mission set
- ✓Strykers fit down the streets of Baqubah
- ✓Soldiers got on and off quickly—Got to the Objective!
- ✓Benefits:
  - ✓WPN Systems—RWS is in color and is precise
  - ✓Quiet compared to tracked vehicles
  - ✓Armored, most of our Soldiers came back home
  - ✓Compatibility—all the platforms can interchange
  - ✓Stryker allows for quick access maintenance—maintainers quickly pull pack, operate, and reinstall
  - ✓Combined arms operations with all Stryker variants
  - ✓Driver Enhancement Kit (DEK)--lifesaver

Captain Damian M. Gill – NDIA Combat Vehicle Conference

- ✓Future Considerations:
  - ✓Space—continue to optimize any small things, ex. Radio mounts, location of Duke
  - ✓Hatches—the RV and NBC RV should have an additional commander's hatch
  - ✓Modified mounts for M240s
  - ✓Stryker Specific Recovery Capabilities
  - ✓Properly designed turret shields for air guards

Mechanized, Motorized, and Maritime Operations in OIF III AAR and Lessons Learned

By
James (Brad) Kelley
CPT, IN
TRADOC Capability Manager, IBCT
Brad.kelley@us.army.mil
310.498.0006 C
706.545.4317 W

Background

- Platoon Leader, 2/11 ACR
- 12 months in Babil Province,35 km South of Baghdad
- M2A2, M1114, and M998 variants
- Missions
  - Cordon and Search
  - “Presence” patrols and Demonstration of Force (DOF)
  - Route Clearance
  - Intelligence, Surveillance, and Recon (ISR)
  - Humanitarian Aid
  - Lethal and non-lethal targeting

USMC Combat Vehicles

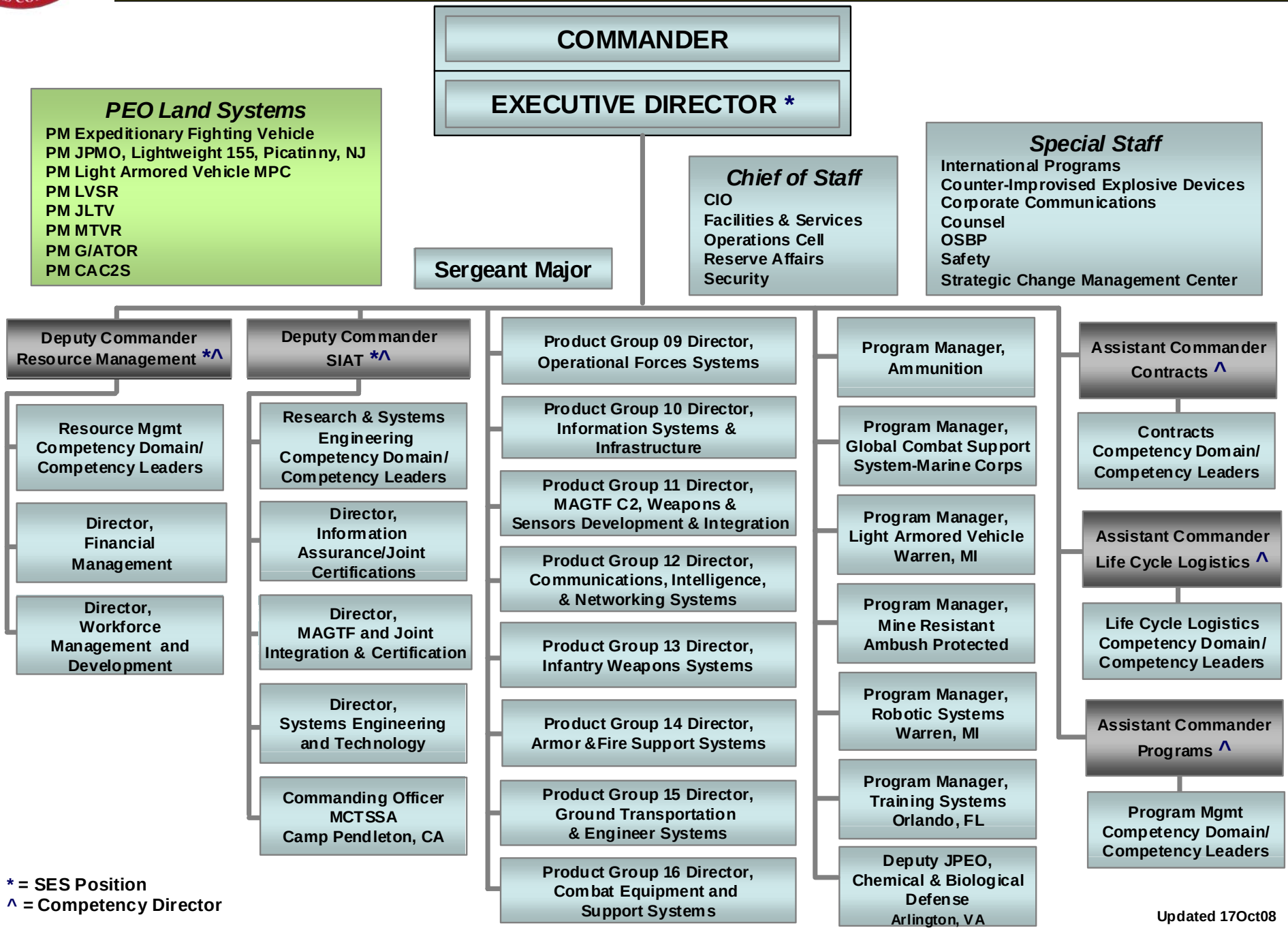
NDIA Combat Vehicle Conference
21 October 2008

Dr. Robert Lusardi
Deputy Program Manager
Light Armored Vehicles

Agenda

- USMC Combat Vehicle Organizations
- Light Armored Vehicles
- Assault Amphibious Vehicles
- Tank Systems
- Expeditionary Fighting Vehicle
- Marine Personnel Carrier
- Q&A

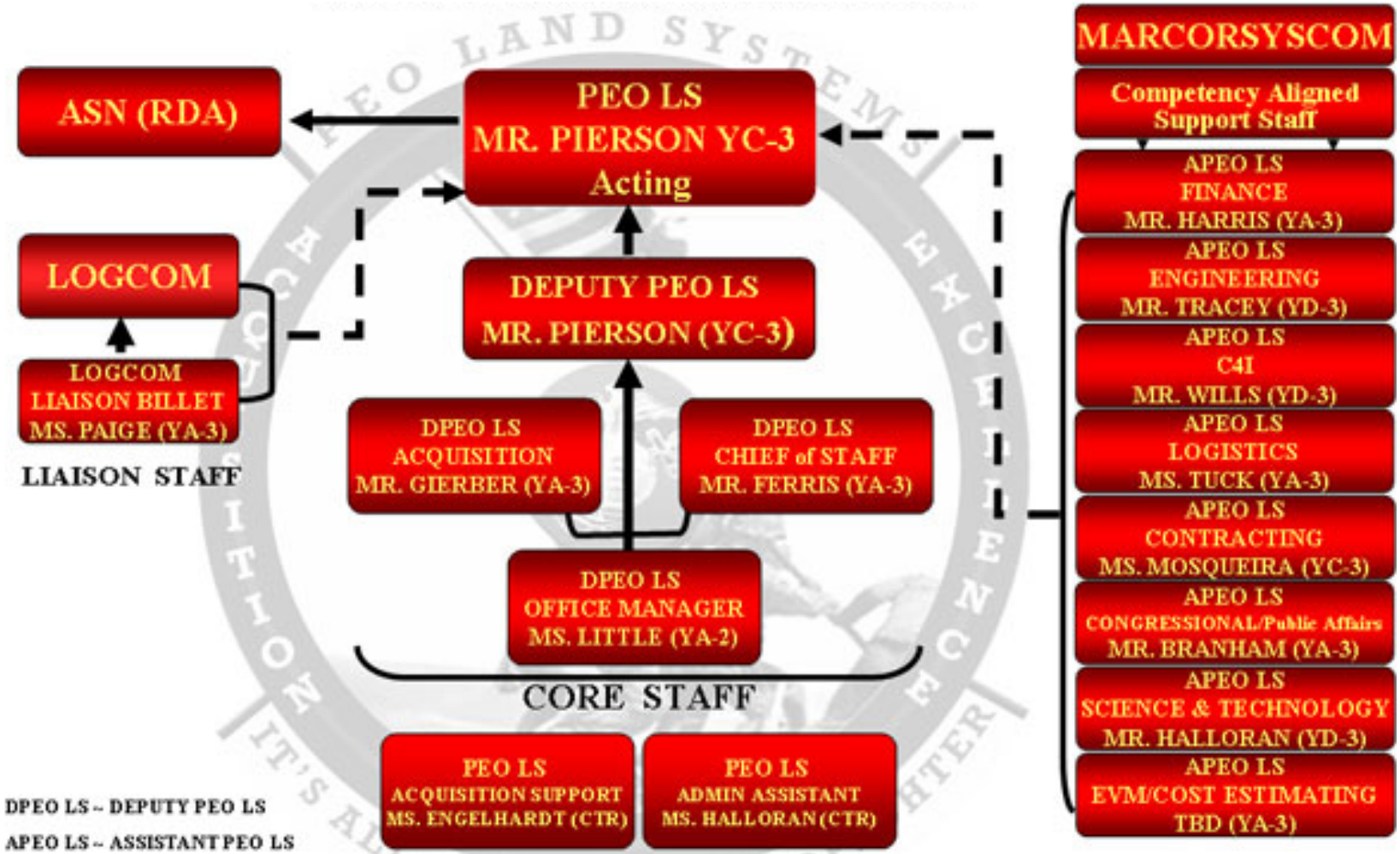
Marine Corps Systems Command



* = SES Position
^ = Competency Director

Updated 17Oct08

USMC PEO Land Systems



PEO LS PORTFOLIO IS $9.7B ACROSS THE FUTURE YEARS DEFENSE PLAN (FYDP).

LW155	LVSR	MTVR	EFV	MPC	JLTV	CAC2S	G/ATOR

"Making the Transition to the Future"

Marine Corps Light Armored Vehicles

NDIA Combat Vehicles Conference

21 Oct 2008

Dr. Robert Lusardi
Deputy Program Manager
Light Armored Vehicles

"Making the Transition to the Future"

PM LAV

➢**PM LAV Mission** - Research, development, acquisition and life cycle support for USMC Light Armored Vehicle family of vehicles.

➢**Our Location** – MARCORSYSCOM program office supported by TACOM in Warren, Michigan

– **LAV – in the Light Armored Reconnaissance Battalion**.
  - Conduct reconnaissance, security, and economy-of-force operations, limited offensive or delaying operations that exploit the unit's mobility and firepower.
  - Eight-wheeled armored combat vehicle with a 25-year history to remain in service until to 2025 and possibly beyond.

– **MPC – will reside in the Amphibious Assault Battalion**.
  - Provide armor-protected mobility for infantry battalion maneuver task forces. 2 MPCs will lift a reinforced rifle squad.
  - The MPC program balances vehicle performance, protection, and payload attributes.

"Making the Transition to the Future"

LAV Modernization Plans

Funded Programs

- LAV SLEP/ Improved Thermal Sight System (ITSS)- Fielding.
- LAV-C2 Upgrade- Moving towards Milestone-C.
- LAV-25 Lethality Upgrade- Working.
- OIF Upgrades, A2 Upgrade, LAV Re-Procurement- Fielding.

Future LAV Programs (FY08-FY09)

- LAV Rapid Acquisitions & Modifications (RAM)
- LAV Survivability Upgrades - Part II
- LAV Fleet Sustainment Upgrades - EPLS

Past RAM Projects

ALL PROJECTS COME OUT THROUGH:

Federal Business Opportunities

www.FedBizOpps.gov

"Making the Transition to the Future"

LAV Survivability Upgrade – Part II

- **Incorporate *Floor Spall Liner***
- ***Protection or Relocation of Fuel Tank***
- **Incorporate *Mine Blast Resistant Seating* where possible**
  - LAV-25
    - VC and Gunner
    - Scouts
  - Mission Role Vehicles
    - VC and staff locations
  - Driver cannot be suspended but will need a reinforced seat and leg protection

LAV - Closing Remarks

- **USMC LAV projected to remain** *in service until 2025*
- **LAV family of vehicles must remain**
  - ***Effective*** in the face of increasing threat capabilities
- *Supportable* **in the face of increasing age (CBM+ & Obsolescence are growing issues)**
- **The challenge:** *How much survivability, lethality and mobility can be packed into an air-transportable, swim-capable LAV?*

- **Near Future:**
  - **LAV RAM projects**
  - **LAV Survivability Upgrades**
  - **LAV Sustainment Upgrades**

Marine Personnel Carrier (MPC)

“Making the Transition to the Future”

MPC: System Description

- MPC is part of a portfolio of capabilities that provide closure to real world operational gaps and shortfalls in the ability of the MAGTF to conduct ground based maneuver tasks. The MPC, as the **medium capability category platform**, provides a bridge in capability between the EFV and JLTV and a **balance between the performance, protection and payload attributes.**
- The MPC is an expeditionary **armored personnel carrier** - ideal for irregular warfare - yet **effective across the full range of military operations**. Providing armor-protected mobility for infantry battalion maneuver task forces.
- The MPC **family of vehicles** includes the base armored **personnel** carrier and two supporting mission role variants: a **command & control** variant and a **recovery** & maintenance variant.
- Each vehicle type will be subjected to automotive performance, electromagnetic effects, reliability, live fire and operational tests.
- Although there is no existing Joint application, there are **ongoing discussions between the Marine Corps and the Army** to identify potential points of joint convergence.

Marine Personnel Carrier (MPC)
Pre-MS A: The Near Future…

- **Currently working with ONR to mature technologies that need to be integrated on the MPC**
  - ***Advance Lightweight Armor*** Materials/ Technologies
  - ***Advanced Seat Technology*** for blast resistance, shock mitigation and roll-over protection
  - ***Active Protection System***
  - On-Board Vehicle Power for ***exportable power***
  - ***Fuel Efficiency*** & Battlefield Power
  - ***Advanced Suspension***
  - ***TBD***

Questions?

AGENDA

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

Future Combat Systems (BCT) Overview

Manned Ground Vehicle Overview

COL Bryan McVeigh, Project Manager

Mounted Combat System Tank, Combat, Full Tracked: Medium

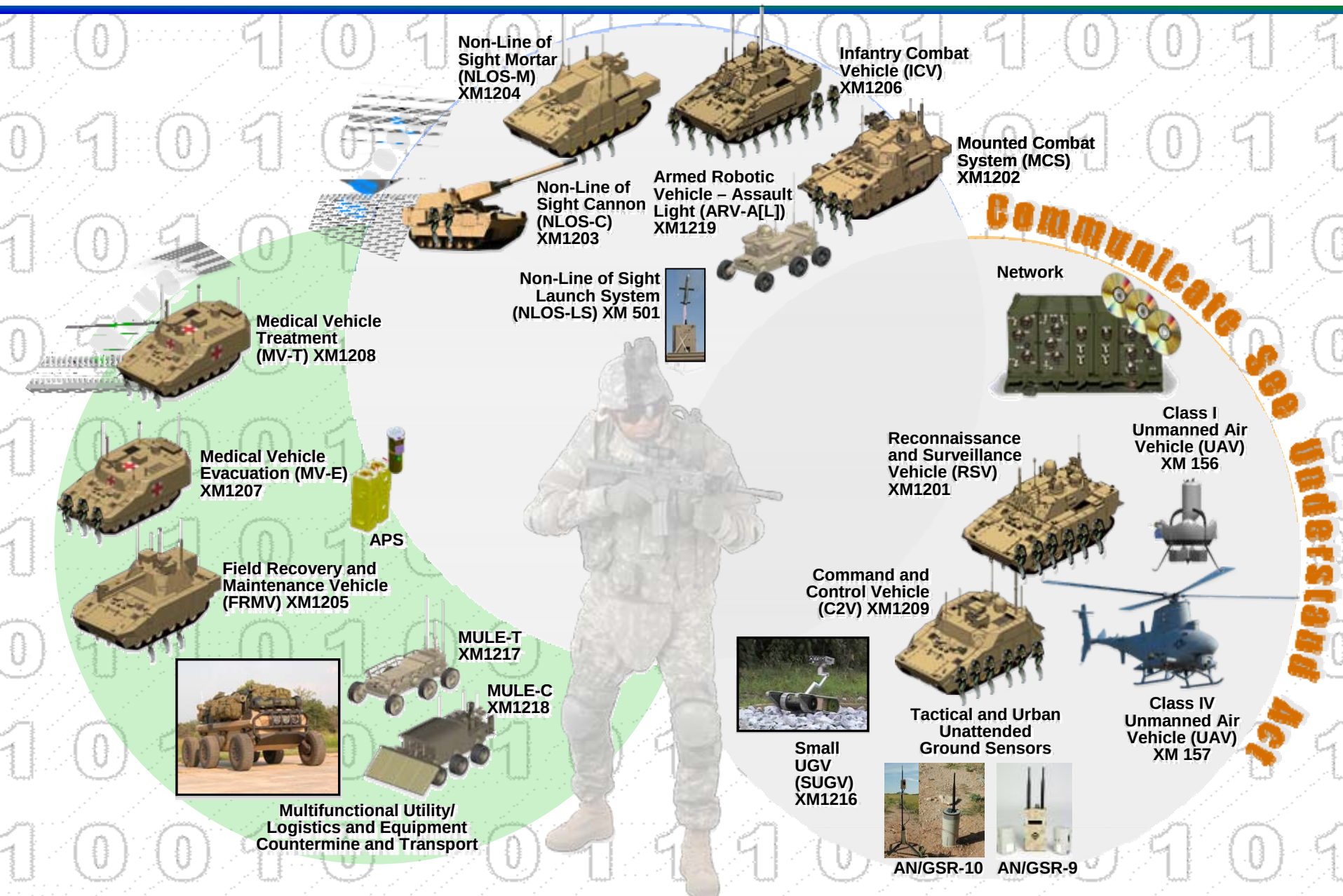
LTC Robert Hannah, Product Manager

Unmanned Air Vehicles Overview

LTC Winfield Keller, Product Manager

Future Combat Systems

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry



Recent Program Accomplishments

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

- Delivered 1st Non-Line of Sight Cannon Prototype (NLOS-C P1) vehicle for testing, successful first round firing
- Completed Spin Out 1 Tactical Field Test (TFT), Field Demonstration, Test and Evaluation (FDT&E), and Preliminary Limited User Test (P-LUT)
- Delivered first set of "accelerated" Small Unmanned Ground Vehicle (SUGV) and Class 1 Block 0 units
- System of Systems Common Operating Environment (SoSCOE) 2.0 Deliveries/Testing
- Completed Autonomous Navigation System (ANS) and Multi-function Utility/Logistics and Equipment (MULE) Vehicle Preliminary Design Reviews
- Completed Joint Expeditionary Force Experiment (JEFX-08)
- Non-Line of Sight Launch System (NLOS-LS) Control Test Vehicle (CTV) 2 Successful Flight
- Airborne Standoff Minefield Detection System (ASTAMIDS) Captive Flight Test
- First end-to-end Active Protection System (APS) Test

Executing to Support Army Modernization Strategy

Manned Ground Vehicle Overview

COL Bryan McVeigh
Project Manager, FCS (BCT), Manned Ground Vehicles

21 OCT 2008

Manned Ground Vehicle (MGV) Family

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

RSV
XM1201

MCS
XM1202

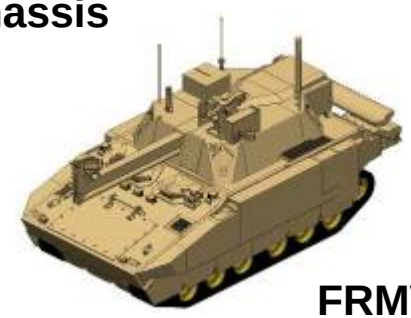
C2V
XM1209

NLOS-C
XM1203

Common
Chassis

MV(E/T)
XM1207/1208

ICV
XM1206



FRMV
XM1205

NLOS-M
XM1204

Manned Ground Vehicles Since the Last Conference

1st QTR 08	2nd QTR 08	3rd QTR 08	4th QTR 08

Oct 07 – Dec 07

RSV Mock-Up Evaluation

MGV Track Testing at YPG - Nov 2007

First Direct and Indirect Vision System Evaluation – Dec 2007

Jan 08 – Mar 08

Non-Line of Sight Mortar Firing Platform Completes Breech Cycle Testing – Jan 2008

XM1201, Reconnaissance and Surveillance Vehicle (RSV) Test Rig – March 2008

Apr 08 – Jun 08

MGV-P3 Power Pack Testing - April 2008

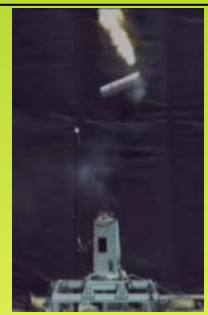
Non-Line of Sight Mortar Firing Platform Completes Phase II Testing – May 2008

Non-Line of Sight Cannon Integration – May 2008

NLOS-C Delivery – Jun 08

July 08 – Oct 08

Active Protection System Design Verification Test



Medical Vehicle Mock-up Pit Stop Evaluations

NLOS-C Prototype 3 Driving

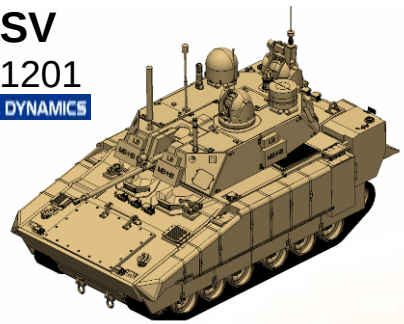
NLOS-C Prototype 1 Firing

Manned Ground Vehicle (MGV) Fleet

Joint development between both of the FCS One Team Partners

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

RSV
XM1201
GENERAL DYNAMICS



MCS
XM1202
GENERAL DYNAMICS

C2V
XM1209
GENERAL DYNAMICS

NLOS-C
XM1203
BAE SYSTEMS

BAE SYSTEMS
Propulsion

GENERAL DYNAMICS
Suspension

GENERAL DYNAMICS
Diesel Engine
Generator

BAE SYSTEMS
Traction Drive
Generator Controller
Prop Electronics
Energy Storage

GENERAL DYNAMICS
Final Drives
Running Gear
HSUs (Roadarms)

BAE SYSTEMS
Band Track

BAE SYSTEMS
Common Crew Station
Hit Avoidance
Armor
Common Software

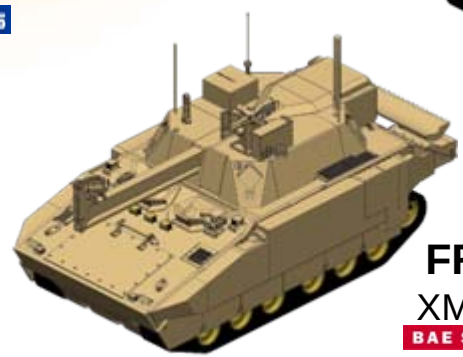
GENERAL DYNAMICS
Core Vetronics
Chassis Aux
Cooling Systems
NBC/ECS
Common Test

Common Chassis
GENERAL DYNAMICS

MV(E/T)
XM1207/1208
BAE SYSTEMS

NLOS-M
XM1204
BAE SYSTEMS

ICV
XM1206
BAE SYSTEMS



FRMV
XM1205
BAE SYSTEMS

XM1202 Mounted Combat System Tank, Combat, Full Tracked: Medium

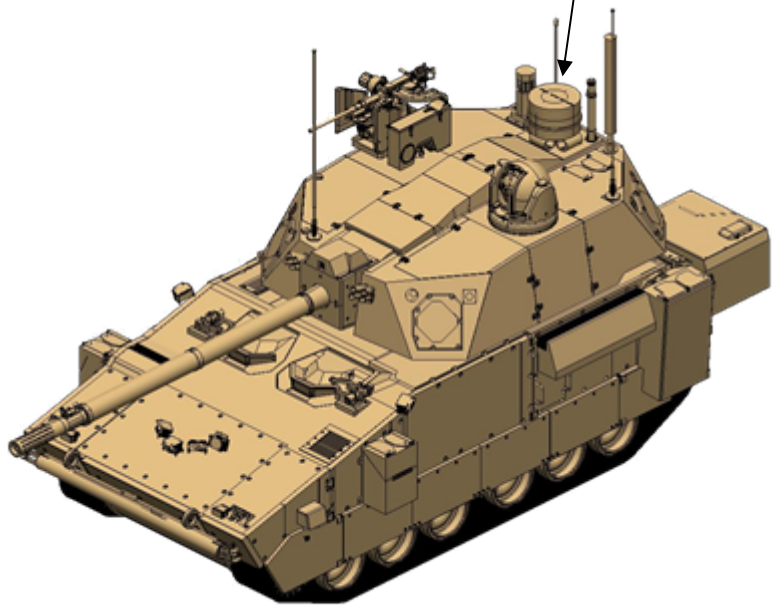
LTC Bob Hannah, PdM MCS

21 October 2008

XM1202 Mounted Combat System (MCS)

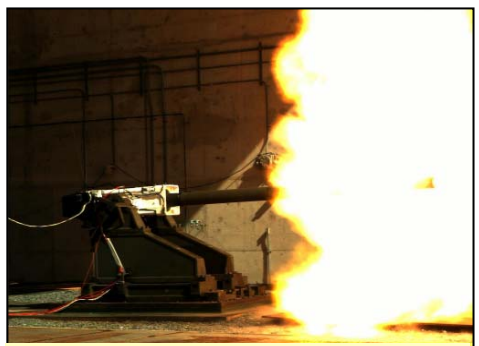
Key Capabilities

- Provides highly lethal, mobile Line-Of-Sight (LOS) and Beyond-Line-Of-Sight (BLOS) capabilities
- Increased rate of fire through auto-loader and the automated ammunition handling system reduces crew fatigue
- Lightweight XM360 120mm cannon with 27 ready rounds
- Fires all current 120mm rounds and Mid-Range Munition (MRM)
- Light/ heavy caliber secondary armament with integrated fire control



Status

- Ammo Handling System/ Primary Weapon Assembly/ Turret Structure/ armament sub-systems were integrated into Firing Platform at the Armament Subsystem Development Laboratory in Shelby, MI
- Began testing the Firing Platform at TARDEC in Aug 08; testing the Firing Platform on live-fire range at Aberdeen Proving Ground beginning 1st Qtr FY09.
- Gun tube Proof testing / Cannon Interim Safety Firing Test #1 completed at Aberdeen Proving Ground. 500-round Safety Firing Test #2 began in 4th Qtr FY08. More than 1650 rounds fired in XM360 development to date.



XM360 Test at APG, MD

Firing Platform Integration

XM 1202 Mounted Combat System

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

1st QTR 08	2nd QTR 08	3rd QTR 08	4th QTR 08

Oct 07 – Dec 07

Ammo Handling System, Primary Weapon Assy, Turret Structure deliveries completed in December 2007

Jan 08 – Mar 08

Ammo Handling System, Primary Weapon Assy, Turret Structure were integrated into the Firing Platform at the Armament Subsystem Development Lab in Shelby, MI from Jan-Jun 2008

Apr 08 – Jun 08

Gun tube Proof Testing/ Cannon Interim Safety Test # 1 completed at Aberdeen Proving Ground in June 2008

Demonstrated Firing Platform functionality for the Army Chief of Staff on 18 June 08

July 08 – Oct 08

MCS Firing Platform Testing on the Turret Motion Base Simulator at TARDEC: Jul – Nov 08

Unmanned Air Vehicles

1st QTR 08	2nd QTR 08	3rd QTR 08	4th QTR 08

Oct 07 – Dec 07

Airframe static load testing

E3 Testing

Jan 08 – Mar 08

Experiment 2.1

Rotor Hub Fatigue Test with the US Navy

Class IV Phase I Assembly of A4 & A5

Apr 08 – Jun 08

ASTAMIDS Initial Flight Test (IFT) and Contractor Flight Test (CFT)

Class I 5hp Heavy Fuel Engine risk reduction test

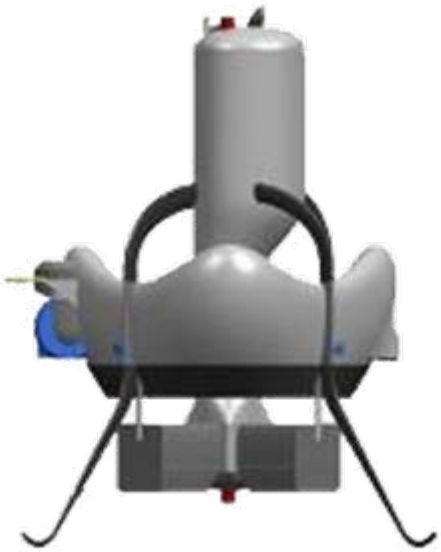
July 08 – Oct 08

Class IV Transportability Test

25th ID deployment of gMAV

P-LUT

Class I Description and Events



Missions

- RSTA
- Laser Designation

Description

- Manpackable/Air Droppable
- Hover & Stare Capability
- EO/IR/LD/LRF Sensor
- Heavy Fuel Engine
- Deployable within Five Minutes

Class IV UAV Overview

Airborne Surveillance, Target Acquisition and Minefield Detection System (ASTAMIDS)

SAR/GMTI

Missions

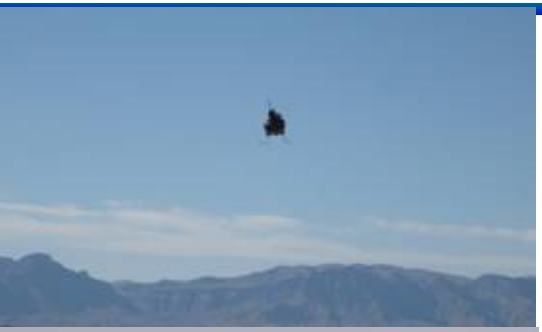
- RSTA
- Laser Designation
- Wide Area Surveillance
- Wideband Communications Relay
- Standoff CBRN
- Met Data for NLOS
- Manned/Unmanned teaming

Description

- Brigade Combat Team organic Reconnaissance, Surveillance, and Target Acquisition (RSTA) capability
- Transportable by Ground, Rail, Sling, C-130
- Autonomously take off and land at unprepared and unimproved landing zones
- Autonomous flight and navigation

Current Efforts

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry



OIF Support

- 36 gMAV air vehicles fielded
- 40+ Trained operators
- Transitioned to PM UAS
- Supporting additional training, fielding, development and procurement

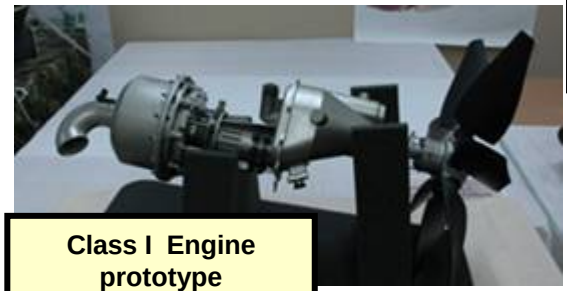
AETF Activities

- 20+ Trained operators
- P-LUT
  - Gimbaled sensor
  - JTRS/SRW integration
  - Lessons Learned
  - TTP
- LUT
  - Engine Control Unit
  - Electric Starter
  - Centralized Controller excursion

Unmanned Aerial Vehicles (UAV)

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

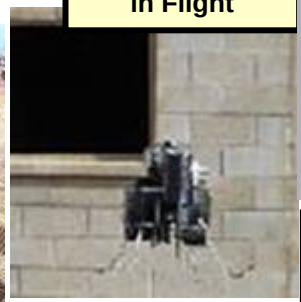
Class I

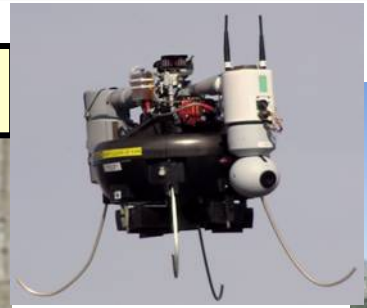


Class I Engine prototype

Class I Block 0 with soldier

Class I Block 0 in Flight





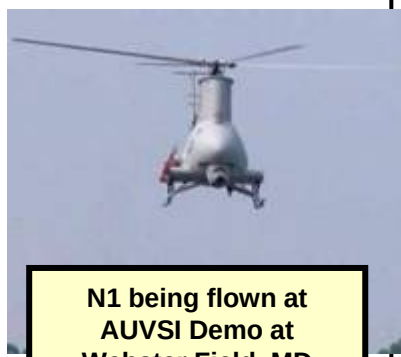
Class I Block 0 with Gimbaled sensor

Experiment 1.1

Army A7 undergoing shipping inspection process at SAC

A2 Engine Run at Moss Point, MS 7 Aug 07

Army / Navy Fire Scouts at Moss Point, MS



N1 being flown at AUVSI Demo at Webster Field, MD

Class IV

Army A5 on Display @ Marine Corp Day, Quantico, VA

Army A2 being loaded on C130 at Trent Lott International Airport, MS

Future Combat Systems Since the Last Conference

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

1st QTR 08	2nd QTR 08	3rd QTR 08	4th QTR 08

Oct 07 – Dec 07

Unattended Ground Sensors & MULE

Jan 08 – Mar 08

B-Kit in M1151A1

Apr 08 – Jun 08

C2V Demonstrator

Captive Flight Test #12 – May 2008

NLOS – LS Test

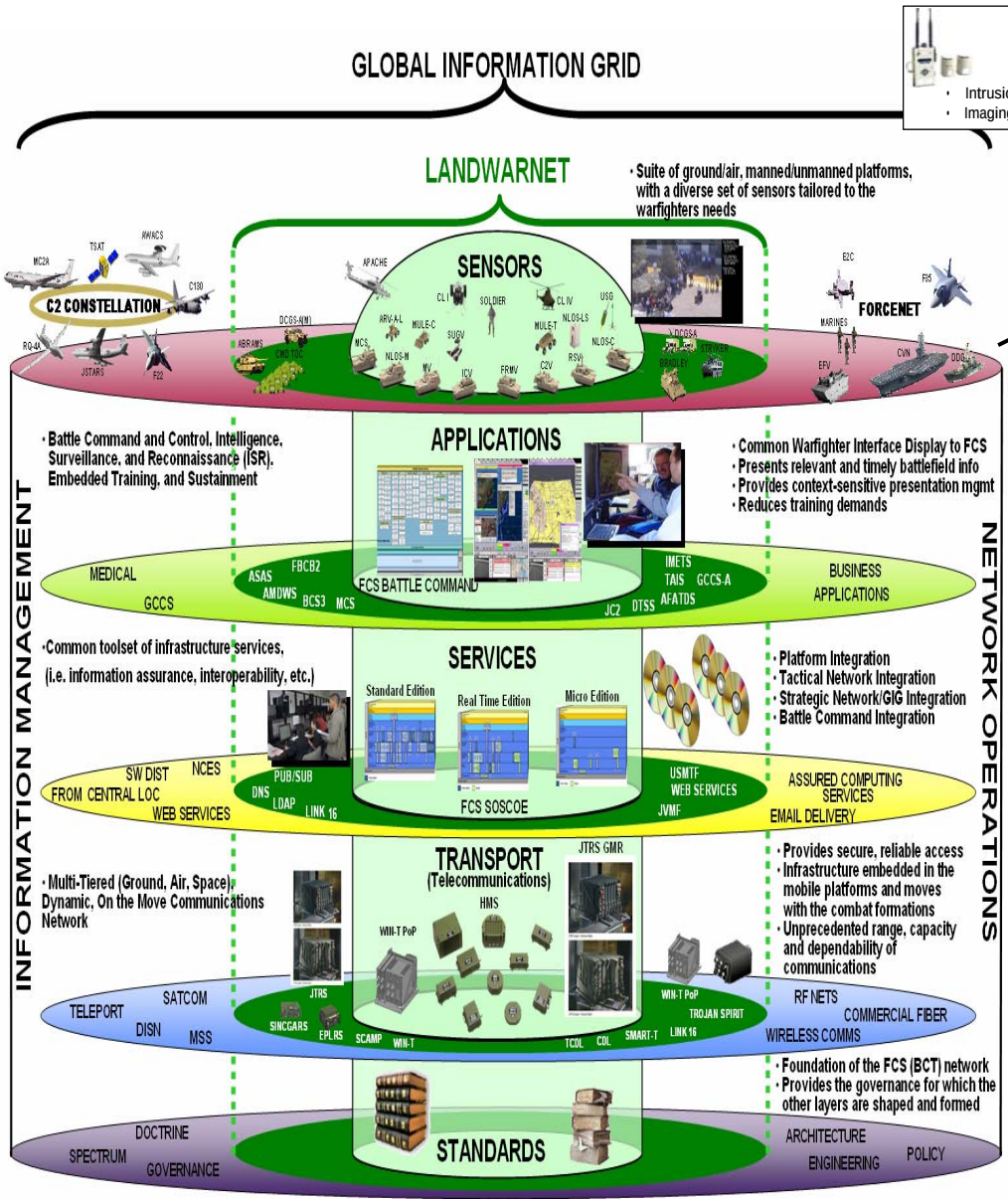
July 08 – Oct 08

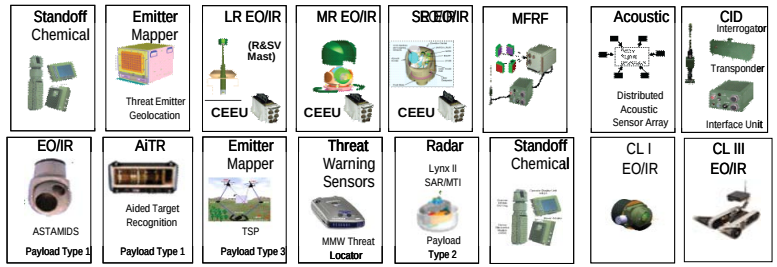
SUGV Video Imagery Sent to B-Kitted HMMWV During Spin Out P-LUT

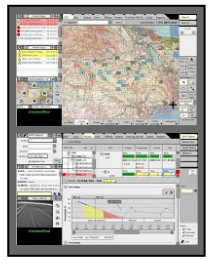
Spin Out P-LUT at AETF

Future Brigade Centric Team Network

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry







Battle Command

SOSCOE

JTRS GMR

JTRS HMS

WIN-T JC4ISR

ICS

JTRS AMF

MGV System Overview

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

Force Protection/Survivability
- Upgradeable Armor
- Active Protection System
- Hit Avoidance Suite
- Mine Kit
- Crew Seating – Ceiling Mounted

Lethality
- Automated Rate of Fire & Precision
- Autoloader = Less Soldiers (MCS, NLOS-C/M)
- Infantrymen: HBCT 324 vs FCS BCT 702
- MCS has 2km LOS & 12 km BLOS Capability

Supportability
- Reduced Sustainment Burden
  - Fuel: 33% reduction
  - Spares: 62% reduction
  - 30 Min. Time To Repair
- 80% of maintenance tasks performed by crew

Commonality
- Common MGV Chassis
- 75% of MGV parts are common to all platforms
- 10 common tools per platform
- 20 total common tools
- Common SW throughout BCT

Affordability
- Reduced Manpower and Sustainment
- Cost less to Maintain: HBCT Support Soldiers 1186 vs FCS BCT 411
- Costs less to train due to Embedded Training
- Vehicle Ao: HBCT >90% vs FCS BCT >95%
- Power and Energy to Grow

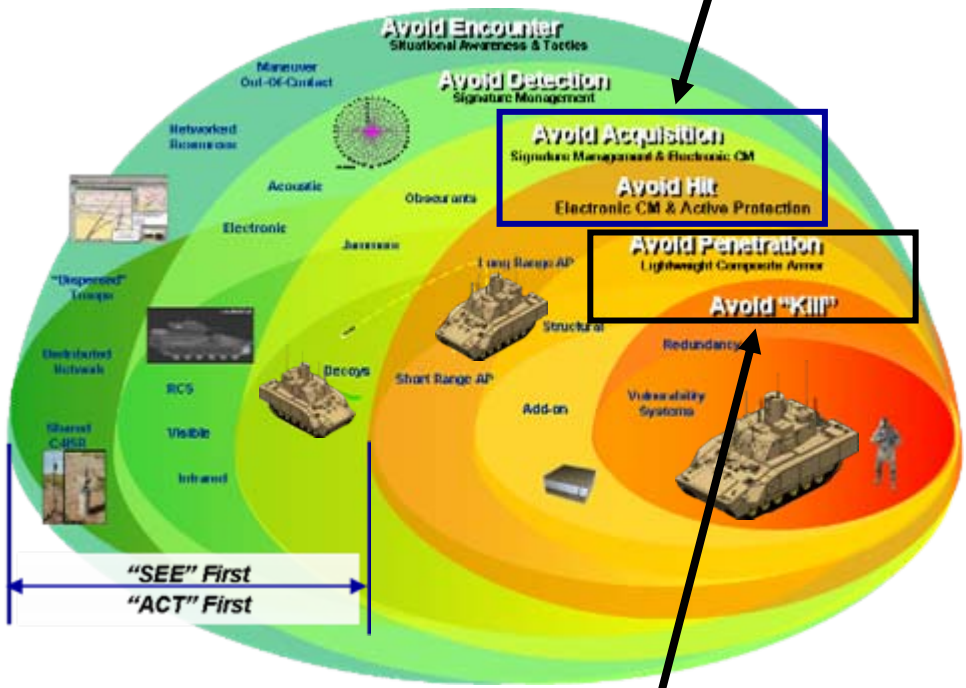
Deployability
- Theater & Strategic Deployable: C-5 / C-17
- Self-deployable (Tactical Road March w/o HETTS)
- Mobility Advantage: Bridges/Unimproved Roads
- Able to use greatest variety of Rail Services

FCS Survivability – A Holistic Approach

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

- **"Onion Skin" methodology which leverages layers to protect the Soldier and equipment**
- **Leverage Power of System of Systems**
  - Avoiding kill
    - **Including reducing impulse to Mounted Soldiers**
  - Avoiding penetration
    - **Including standoff and ballistic protection**
  - Avoiding acquisition and hit with countermeasures
    - **Including decoys**
  - Avoiding encounter with situational awareness and tactics
    - **Including detection using Multifunctional Utility/Logistics and Equipment Vehicle - Countermine (MULE-CM)**

Platform Hit Avoidance System is one component of Full Spectrum Survivability



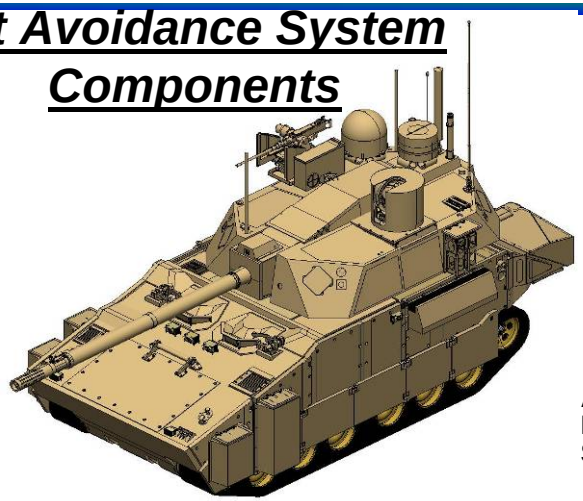
Ballistic Protection and other platform attributes further support Soldier Survivability

MGV On-board Survivability Suite

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

Active

Hit Avoidance System Components



Multi-Function Counter Measure (MFCM)

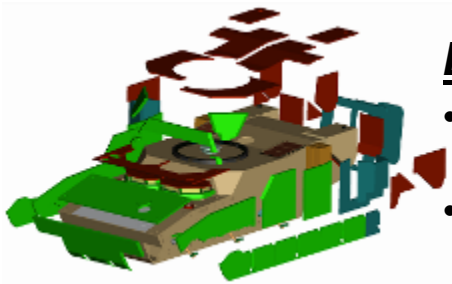
Passive Threat Warning Sensor (4X)

MFRF Radar Antenna (4X)

Laser Threat Warning Sensor (4X)

Active Protection System (APS)
Long Range Counter Measure
Short Range Counter Measure

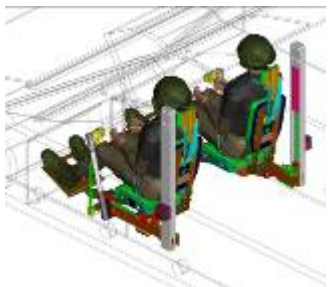
Passive



Base "B" Armor

- **Armor upgradability designed into each MGV via A+B approach**
- **Bx/Ux path forward provides periodic armor updates every ~3 years**
- **Modular AT Mine kit**

Soldier



Vehicle Structure and Crew Seats

- **Designed to mitigate impulses to Soldier**

Short Range Countermeasure will Defeat

Bomblet

RPG

Long Range / MFCM Countermeasures will Defeat

ATGM

Tank HE/ HEAT

Tank KE

BLOS Top Attack

Armor & Mine Kit will protect Against

Auto-Cannon

Heavy Machine Gun

Mines

HE Frag

MGV Common Chassis

Status

- **Maturing common chassis design in advance of MGV PDR**
- **Various components in test now including hybrid electric propulsion, composite armor, active protection system, and bandtrack & hydro-pneumatic suspension**
- **P1 NLOS-C chassis assembly complete**
- **P3-P6 NLOS-C chassis integration & assembly ongoing**

MGV ICV & RSV

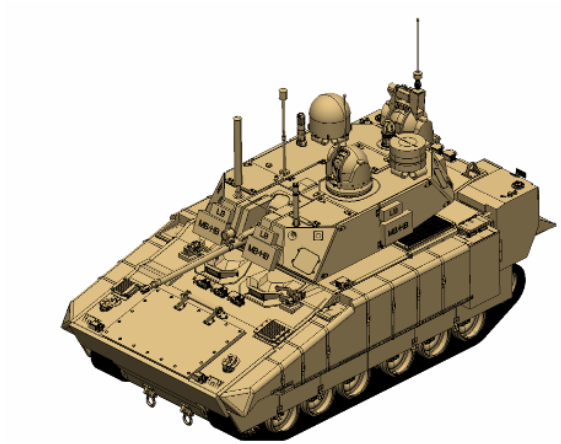
PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

Infantry Combat Vehicle (ICV)

Status

- **Conducted ICV mock-up ingress/egress demonstrations**
- **Awarded system subcontracts for:**
  - **M240 remote operating kit**
  - **30mm ammunition handling system**
  - **Mk44 30mm gun**
- **Conducted critical design reviews for the gun turret drive system, multi-media slipring, off-slipring processing system and ammunition**

Reconnaissance & Surveillance Vehicle (RSV)



Status

- **Continuing to mature RSV design to PDR**
- **Maturing SIGINT integration approach**
- **Executing RSV Rooftop Deconfliction Test**
  - Turreted Rooftop Test Rig construction completed
  - Physical placement and electro-magnetic interference assessment in process
  - Test began July 2008

MGV C2V & MCS

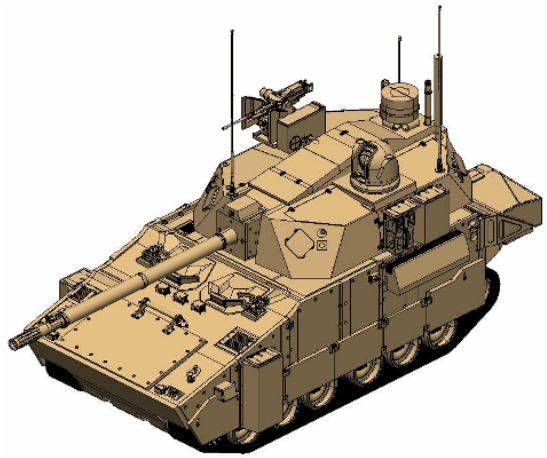
PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

Command & Control Vehicle (C2V)

Status

- **Continuing to mature C2V design to PDR**
- **Maturing SIGINT integration approach**
- **Preparing for Rooftop Deconfliction Test phase 2**
  - Architecture update, E3 and Test model update
  - Test to begin March 2009

Mounted Combat System (MCS)



Status

- **Ammo Handling System/ Primary Weapon Assembly/ Turret Structure/ armament sub-systems were integrated into Firing Platform at the Armament Subsystem Development Laboratory in Shelby, MI**
- **Began testing the Firing Platform at TARDEC in Aug 08; testing the Firing Platform on live-fire range at Aberdeen Proving Ground beginning Nov 08.**
- **Gun tube Proof testing / Cannon Interim Safety Firing Test #1 completed at Aberdeen Proving Ground. 500-round Safety Firing Test #2 began in Jul 08. More than 1400 rounds fired in XM360 development to date.**

MGV NLOS-C & NLOS-M

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

Non-Line Of Sight – Cannon (NLOS-C)

Status

- **Firing platform at YPG fired over 2800 rounds**
- **Prototype #1 – Rolled out at Army Birthday**
- **Prototype #1 start Firing testing Sep 08**
- **Prototype #3 start Mobility testing Oct 08**
- **Prototype #4-6 Mission Module and Chassis assembly and integration ongoing**

Non-Line Of Sight – Mortar (NLOS-M)

Status

- **NLOS-M Firing Platform has fired 1178 rounds**
- **Ultra-light weight tube delivered and tested during Phase II at Camp Ripley**
- **Upgraded and Tested In-bore Air Retention System and Automated Mortar Cleaning System at Camp Ripley Apr-May 08**
- **Mortar Ammunition Handling System in process of being assembled**

MGV MV-E/T & FRMV

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

Medical Vehicle – Evacuation (MV-E)
Medical Vehicle – Treatment (MV-T)

Status

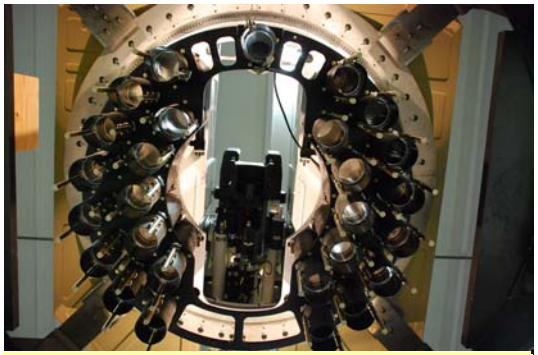
- Executed MV-E PitStop Engineering Evaluation validating the design of the litter lift handling system, placement of medical equipment and medic workstation
- Incorporated PitStop evaluation findings to improve LLHS design, placement of medical equipment and medic workstation design
- Conducted data entry assessment using the Rapid Automated Medical Processing System
- Executed MV-T Mock Up Demonstration and Evaluation
- Conducted assessment on MV-T medical equipment set stowage, MV-T treatment table and MV-T shelters

Field Recovery & Maintenance Vehicle (FRMV)

Status

- Increased design-to capacities for the recovery equipment and maintenance lift to support all FCS manned and unmanned ground vehicles
- Completed recovery winch and crane boom actuator Preliminary Design Reviews
- Maintained Light Weight Tactical Crane and Towing Component Maturation Plans per baseline plans

XM1202 MCS Recent Accomplishments



Ammunition Handling System

- Ammo Handling System/ Primary Weapon Assembly/ Turret Structure/ armament sub-systems were integrated into Firing Platform at the Armament Subsystem Development Laboratory (ASDL) in Shelby, MI from 2nd – 3rd Qtr FY08.
- Demonstrated Firing Platform functionality to the Army Chief of Staff on 18 Jun.
- Gun tube Proof testing / Cannon Interim Safety Firing Test #1 completed at Aberdeen Proving Ground in 3 Qtr FY08.
- Firing Platform began testing on the Turret Motion Base Simulator in 4th Qtr FY08.
- More than 1650 rounds fired in XM360 development to date.

Firing Platform Integration

XM360 Test at APG, MD

GEN Casey at the ASDL in Shelby

Firing Platform on TMBS at TARDEC

Class I FY 09 and 10 Way Ahead

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

FY 09

- Conduct Class I PDR - 1st Qtr FY09
- Procure Engines and Airframes for Early Developmental Assets
- Conduct EO/IR/LD/LRF Payload CDR – 3rd Qtr FY09
- Conduct Class I 1st Risk Reduction Flight – 4th Qtr FY09

FY 10

- Conduct Class I CDR – 2nd Qtr FY10
- Procure Remaining Engines and Airframes for Early Development Assets
- Risk reduction flight on Early Developments Assets – 4th Qtr FY10

Class I Engine prototype

EDA Risk Reduction flight

Class IV FY 09 and FY 10 Way Ahead

PROGRAM MANAGER FCS BRIGADE COMBAT TEAM
One Team-The Army/Defense/Industry

FY 09

- **Conduct Class IV UAVS Preliminary Design Review (PDR) 1st Qtr FY 09**
- **Complete Phase 1 of air vehicle assembly at Moss Point, MS for Air Vehicles A6-A8**
- **Support ASTAMIDS EO/IR/LD/CM payload CDR 3rd Qtr FY 09**
- **Conduct Cooperative Rotor Hub Fatigue Testing to begin 1st QTR FY 09**
- **Support ASTAMIDS Contractor Flight Testing at YPG 1st QTR FY 09**

FY 10

- **Conduct Class IV UAVS Critical Design Review (CDR) 1st Qtr FY 10**
- **Begin Phase 2 of air vehicle assembly (includes installation of FCS unique equipment) at Moss Point, MS for air vehicles A1-A4**
- **Conduct integration and test at Northrop Grumman/FCS Class IV UAV System Integration Lab (SIL):**
  - JTRS HMS SFF-J and WIN-T radios
  - ASTAMIDS and SAR/GMTI payloads
  - Type IV ICS brass board

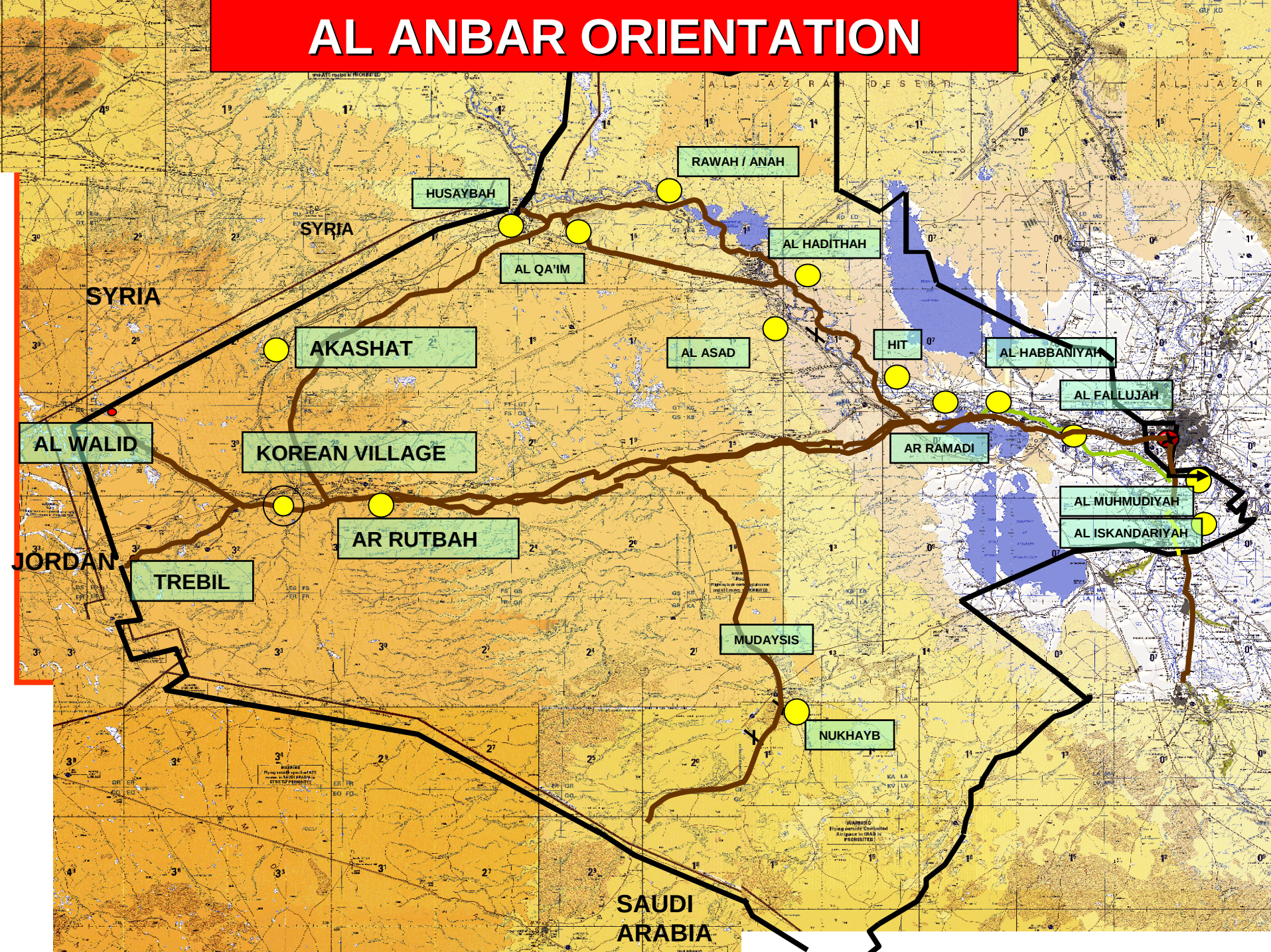
Moss Point, MS Assembly Facility

Marine Corps Light Armored Vehicles

Major Innes Quiroz, Operations Officer
Program Managers Office, Light Armored Vehicle

Introduction

- Maj Innes Quiroz
  - Marine Corps 1982 - Current
  - Multiple Marine Expeditionary Unit LAV deployments, “Life at Sea”
  - OIF I, *“The March Up”, Infantry Company Commander, Co K, 3d Bn, 7th Marines, 1st MarDiv*
  - *OIF II, “Al Fajr”, Operations Officer, 3d LAR Bn, 1st MarDiv*
  - *Currently Operations Officer for PMO LAV*
    - *Acquisitions billet representing LAV users worldwide*


AL ANBAR ORIENTATION
RAWAH / ANAH
HUSAYBAH
SYRIA
AL HADITHAH
AL QA'IM
SYRIA
AKASHAT
AL ASAD
HIT
AL HABBANIYAH
AL FALLUJAH
AL WALID
KOREAN VILLAGE
AR RAMADI
AL MUHMUDIYAH
AR RUTBAH
AL ISKANDARIYAH
JORDAN
TREBIL
MUDAYSIS
NUKHAYB
SAUDI ARABIA

LAV Points for Industry

- LAVs Deployed Globally (Expeditionary, OIF & OEF)
  - Need to retain tactical, operational and strategic mobility
- Task Organized - Rarely LAV pure
  - Must remain interoperable
- Weight is always an issue
- Electrical Power Constraints
- Space Claim
- Need Scalable Protection to meet the threat and environment

NDIA Combat Vehicle Conference

Army Capabilities Integration Center

LTG Michael A. Vane

Deputy Commanding General, Futures and
Director, Army Capabilities Integration Center
US Army Training and Doctrine Command

21 Oct 2008

Army Capabilities Integration Center

Mission

The Army Capabilities Integration Center leads the development and integration of force capabilities across the DOTMLPF for the Army within a Joint and Multinational environment to support Joint Force Commanders.

Vision

World class professionals developing innovative, integrated, resource-informed, and outcome-based solutions for the current to future force.

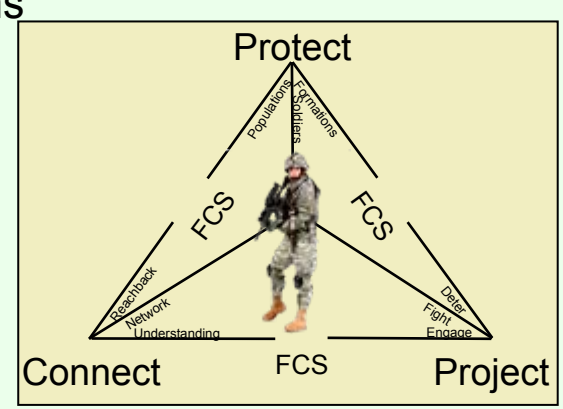
ARCIC Priorities

Build the force: by 2024, field the modular force as envisioned by the Army Capstone Concept.

Connect
- Develop affordable and achievable LandWarNet and LWN Systems
- Enable Unified Battle Command
- Develop Network Vulnerability Strategy
- Develop bridge to Ground Soldier System

Protect
- Optimize current and future force readiness; minimize opn'l risk
- Develop organizationally based force protection capabilities

Project
- Deliver expeditionary full spectrum capabilities to the force.
- Joint Future Theater Lift and Tactical Lift
- Accelerated current capabilities while modernizing the future force



Think and learn for the Army: conceptual framework beyond 2024.

- QDR Roles and Missions Support to ARSTAF
- Collect & analyze operational data to better represent Irregular Warfare
- Develop Human Dimension, Generating Force, Capstone Concepts
- Execute CSA/CG TRADOC Future Warfare Study
- Campaign of Learning
  - –Leading from the edge
  - –Baseline and integrate analyses: Mod Force, FCS, and SBCT.
  - –Conduct other key analyses reflecting force effectiveness;
    - Tactical Vehicle Strategy
    - RSTA and ISR support to BCT
  - –Capability Needs Analysis; timely to meet warfighter needs

Adapt community of practice culture to deliver organizationally-based solutions.

- People
  - –Training, Education, and Certification
  - –NSPS and Evaluation links to Objectives
- ARCIC Campaign Plan
- Implement COEs w/ FCS COE

Among other things…..

- **Help the Army think**
- **Account for the future strategic environment**
- **Advocate Joint Interdependencies**
- **Warfighter's "*agent*" for capabilities development**
- **Voice for Army S&T and FCS Stratcoms**
- **Interface with academia, industry, labs….**
- **Key integration role: future force and *current* fight**

Big-Five Warfighter Outcomes to Guide S&T Investment

Battle Command Network

- Beyond-line-of-sight
- Integrate Command and Control
- Optimized for mobile operations
- Increase access and available to all echelons and the individual Soldier

Counter IED and Mine

- Detect, identify and neutralize CBRNE obstacles
- Safe standoff distance
- Determine threat, select best method to neutralization, and ascertain potential effects
- Maintains maneuver force momentum while protecting Soldiers and platforms

Power & Energy

- Enhanced agility to operate worldwide, reducing weight and volume
- Sufficient pulsed power enabling advanced lethality options
- Increased continuous power and fuel economy
- Emerging electrical components and systems require dismounted Soldiers to possess a radical increase of available power, at half the tactical weight.

Power ("P") = rate at which work is performed or energy transmitted.
Energy ("E") = capacity to do work.
Work = force times distance (dot product) moved in the direction of the force.

Big-Five Warfighter Outcomes to Guide S&T Investment

Human Dimension

- *Enhance & restore cognitive and physical performance*
  - *Function efficiently as integral component of a network and society*
    - *Interface with multiple unmanned systems*
    - *Mitigate the increase in physiological and psychological stress*
      - *Improving mental, moral and physical capacity and performance*

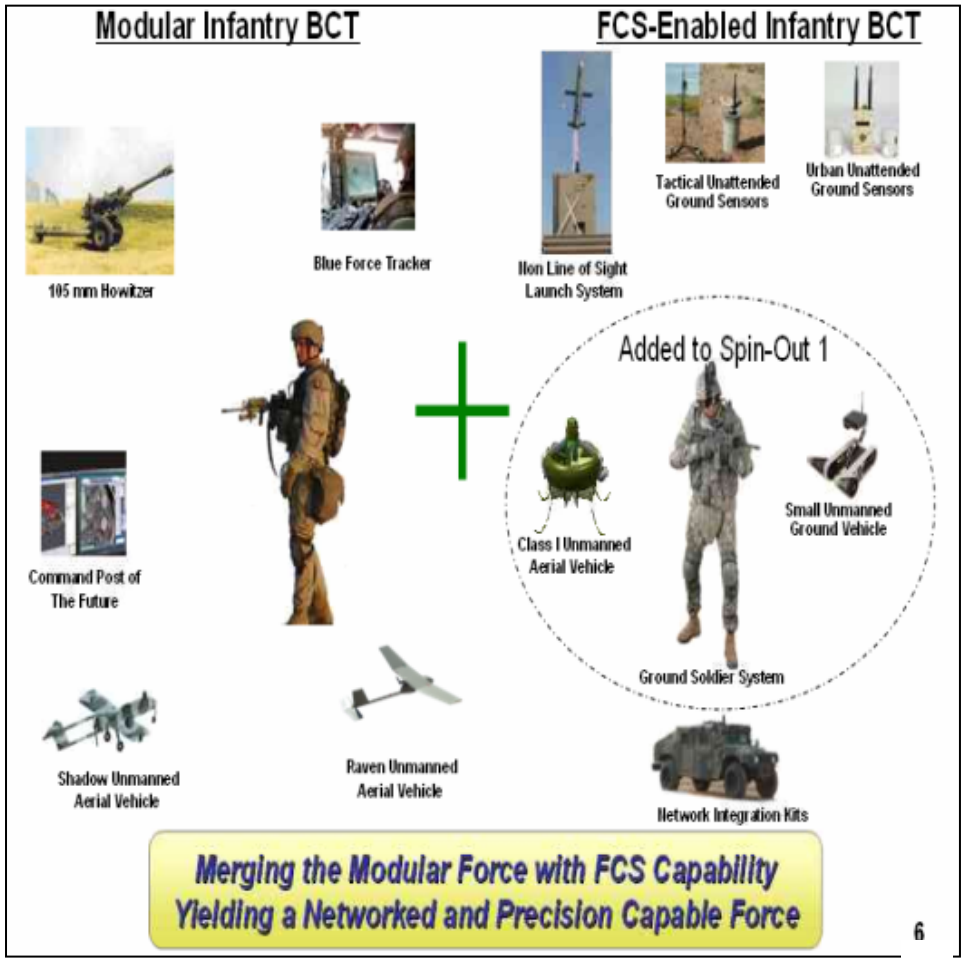
Training

- *Live, virtual, constructive and mixed venues*
- *Enable the Future Force to impart more skills, faster, at lower and with greater retention than currently achievable*
- *Use non-traditional home station training techniques and technology, train prior to employment*
- *Enhance and account for individual proficiencies and learning rates (outcome based)*
- *Leader development must be completely adaptable and scalable to cover the full spectrum of operational challenges facing the Soldier*

Refocusing Spin-Outs to IBCTs

Focus Before

- Most vulnerable force (Infantry Brigade Combat Team) not getting Spin-Outs until FY14.
- Spin-Outs were focused on the most capable force – Heavy Brigade Combat Teams.
- Not achieving integration of the Soldier in the network fast enough.
- Not getting Spin-Outs to current force fast enough.
- ***Size, weight, and power challenges with current heavy platforms (Abrams, Bradley, Stryker, M113, & Paladin).***
- Multiple Battle Command Systems.



Way-Ahead

- Spin-Outs focused on most vulnerable force (Infantry Brigade Combat Teams) first-FY11.
- Willing to accept risk, Heavy Brigade Combat Teams are good enough for now.
- Soldier in the network with Ground Soldier Ensemble – FY12
- Accelerating and adding needed capabilities to the current force.
- Integrated Battle Command System.

The Vehicle Challenge

Develop a vehicle strategy that will support the Army in an Era of Persistent Conflict …..

- ***By meeting force requirements for deployability, mobility, lethality, and survivability***
- ***By providing more Soldiers to engage adversaries***
- ***By increasing power requirements for:***
  - ***Battle Command***
  - ***Weapon systems***
  - ***Stability and Support Operations***
- ***Supported by reducing sustainment requirements for:***
  - ***Manpower, fuel, and ammunition***
  - ***Equipment (vehicles, trailers, generators, tools…)***
  - ***Life-cycle costs***

What is the magnitude of the problem?

Combat Vehicles *(Total MTOEs, TDA, APS)*

≈ 2349
all variants

≈ 3834
all variants

≈ 2516
all
Variants

- ***Performing superbly in combat today but…***
- Reaching limits of space, weight, and power
- Driving unaffordable sustainment requirements
  - Support vehicles *(ammo, fuel)*
  - Repair vehicles, wreckers
  - Trailers
  - Generators
  - Support personnel *(maintenance, supply, refueling, ammo…)*

≈ 1594
all variants

≈ 974
all variants

≈ 5877
all variants

Tactical Wheeled Vehicles

A snapshot of the Light, Medium and Heavy Tactical Wheeled Vehicle (TWV) Fleet



LIGHT	MEDIUM	HEAVY
156,868	65,562	24,976
64%	26%	10%



- Numbers do not include ASV, STRYKER, MRAP

ASV **STRYKER** **MRAP**

BLUF

- *The Army has documented need for 295,997 TWVs*
- *There are 247,406 TWVs fielded*
- *~ 15% - 20% of TWV fleet is armored*
  - *Total includes armored vehicles procured under the Operational Needs Statement (ONS) OEF/OIF*
- *86 variants (Light, Medium, Heavy)*
- *25,047 Medium vehicles are over 30 years old:*
  - *38% of the Medium fleet*
  - *Nearly 23,000 vehicles with manual transmissions ~ requires additional training*

Generators and Trailers

Army Tactical Electric Power Requirements

Army has 102,000+ Generator Sets

Command & Control

8,728 Gen Sets (8%)

Maneuver Support & Sustainment

68,439 Gen Sets (67%)

Fire Support

2,769 Gen Sets (3%)

Air Defense

1,735 Gen Sets (2%)

Maneuver

16,255 Gen Sets (16%)

Mobility/Counter-Mobility/Survivability

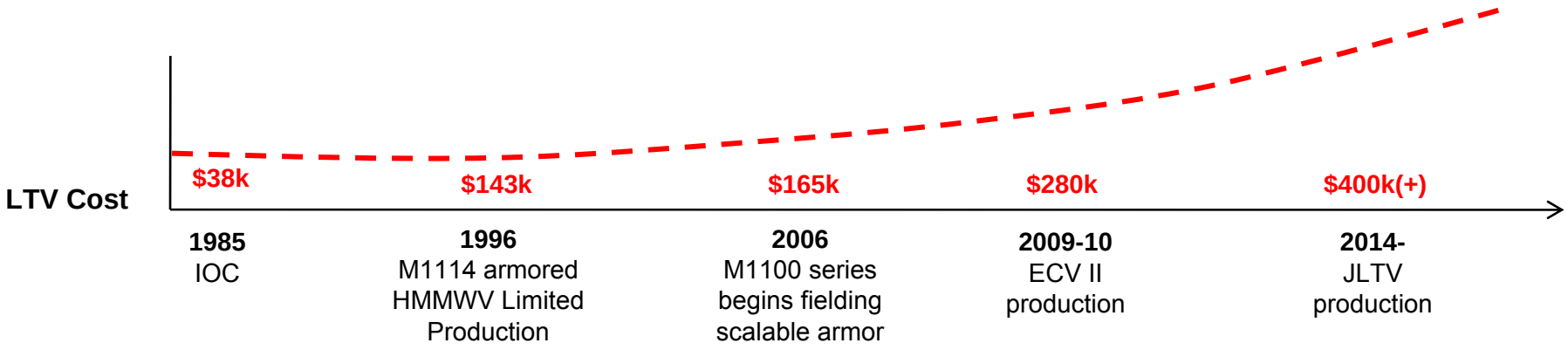
4,567 Gen Sets (4%)

Trailers

Light = 12,517
Med = 9,906
Heavy = 34,226

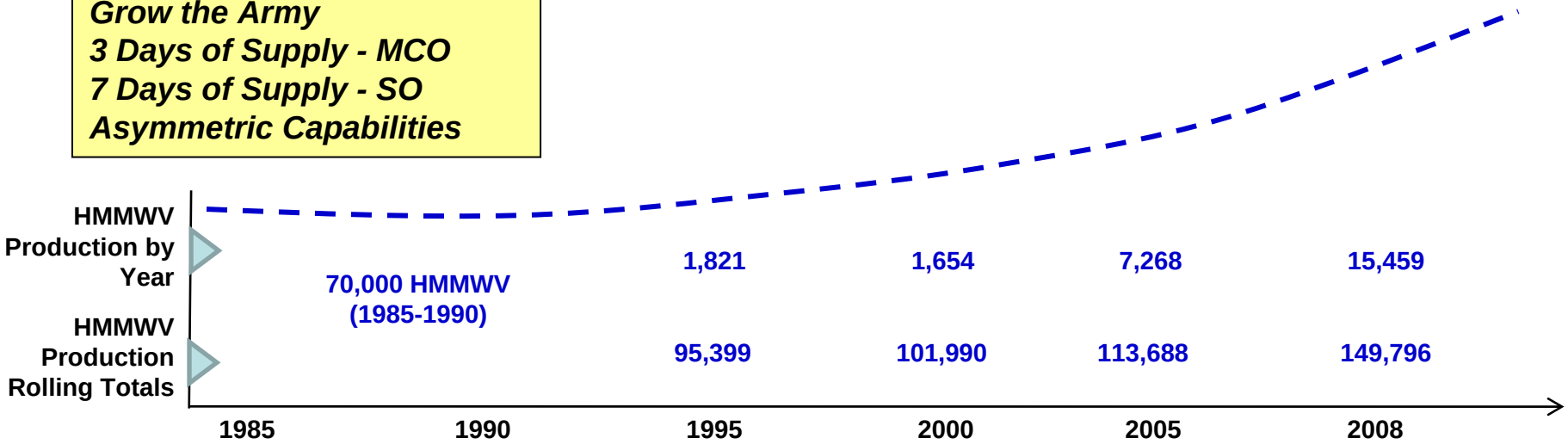
Total
56,649

Increased Quality and Quantity Drive Increased Overall Cost



Growth Drivers :

Modularity
100% Mobility
Grow the Army
3 Days of Supply - MCO
7 Days of Supply - SO
Asymmetric Capabilities



Where we need help from Industry

- **Holistic protection concepts and strategies. Move beyond just more armor.**
- **Power and Energy Strategy**
  - **Improve fuel efficiency**
  - **Reduce transportation & distribution requirements (vehicles, trailers)**
  - **Increase power capacity**
  - **Eliminate Generators**
- **Improve Reliability, Availability, Maintainability**
  - **Embedded diagnostics**
  - **Parts and tool reduction**
  - **Improve life-cycle costs**
  - **Reduce number of support personnel requirements**
- **Improve Lethality and packaging of ammo**
- **Reduce Weight, improve mobility and deployability**

NDIA Combat Vehicle Conference

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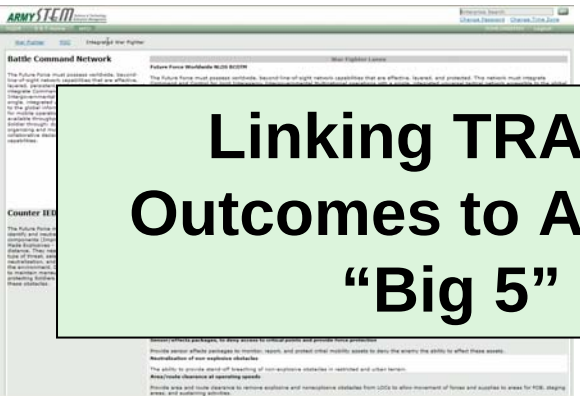
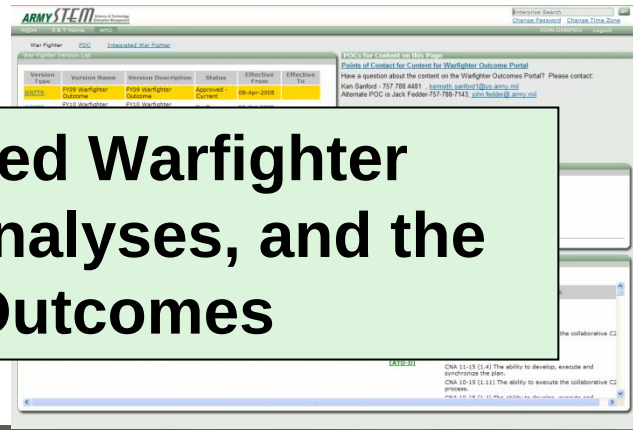
Warfighter Outcomes Portal

- **Purpose:** Link and Track Capability Need Priorities to S&T Investments
- Assists TRADOC CDIDs/DCDs to
  - Define and monitor Warfighter Outcomes (WFOs)
  - Crosswalk WFOs to Authoritative Sources
  - Link and track potential solutions from ATOs, SBIRs, etc.
- Assists Army S&T Community to link investments to WFOs
- Links:
  - Army S&T Enterprise Management System
  - Army Small Business Innovative Research System
  - PEO C3T T2MATRIX Database





Linking TRADOC CDID/DCD Managed Warfighter Outcomes to Army S&T, JCAs, Gap Analyses, and the "Big 5" Integrated Warfighter Outcomes

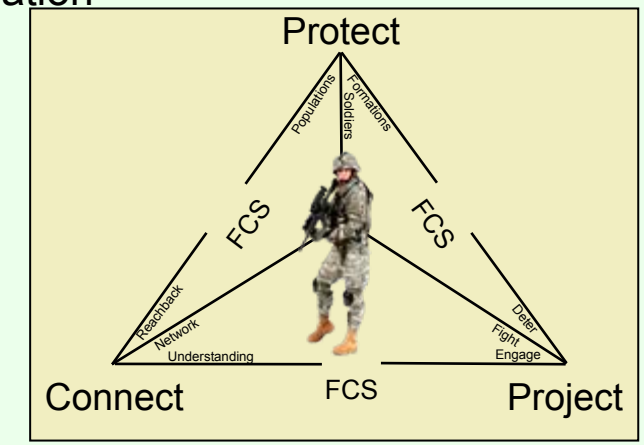
Warfighter Outcomes to Guide S&T Investment

- Stand alone statements that articulate capabilities needed for the Army Warfighter by FY 2024 and include:
  - Clearly articulated description of capability.
  - Rationale explaining reason for the capability.
  - Metrics to describe achievement of the capability.
- "Big Five" Warfighter Outcomes
  - Army Leadership "top down" investment areas that have the potential for a profound impact on future capabilities.
  - Requirement for cross-domain coordination warrants Senior Leadership awareness and monitoring of progress toward achieving capability.
  - Sufficiently shape the S&T Investment so that the capability can be realized within the next 10-15 years.

ARCIC Outcomes

Build the force: by 2024, field the modular force as envisioned by the Army Capstone Concept.

- AROC Approval of Rifleman Radio
- LandWarNet CONOPS approved 11 Feb 08
- USMC & Army common way-ahead for Position Location Information
- Unified Battle Command
- Tactical Wheeled Vehicle Strategy
- Requirement Determination Phase of TAA 10-15
- Redesign of Division, Corps, and ASCC (DP 123)
- Combat ID ICD validated by JROC in Aug
- TF ODIN
- FFID IOC 1 Oct 07
- Spin-out 1 Force Development Test and Evaluation (May 08)
- Accelerated fielding and training of SUGV and Class I UAS
- Implemented SO1 change from HBCT to IBCT



Think and learn for the Army

- Protection Strategy
- Organizational Based Assessment
- Combat and Tactical Vehicle Strategy (PDM II)
- Brigade Combat Team Holistic Review
- Army / Air Force UAS CONOP
- CCJO and JOE development
- ARCIC Technology and Industry Information Exchanges
- Human Dimension Concept
- Emerging Global Trends
- Success of Army Expeditionary Warrior Experiments

Adapt community of practice culture

- CNA in support of POM 11-15
- Re-focused Warfighting Outcomes to support S&T investment
- TR 71-20
- Teamed with HQDA to write and staff AR 71-9
- Developed ARCIC Campaign Plan
- NSPS