Combat Vehicle Conference

9 NOV 2010

Mr. Scott Davis

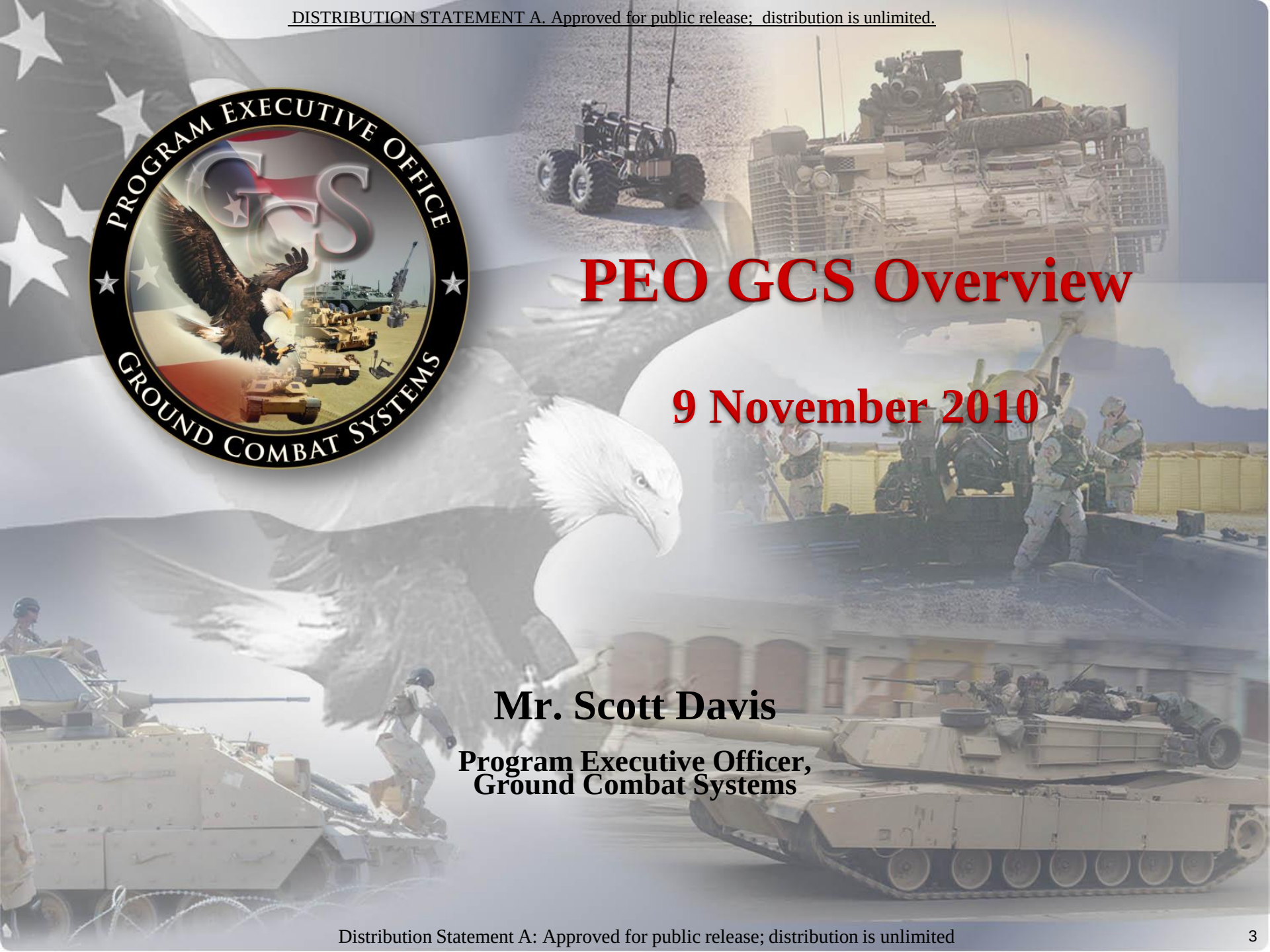
Program Executive Officer,
Ground Combat Systems

Agenda

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

PROGRAM EXECUTIVE OFFICE GROUND COMBAT SYSTEMS

OUR MISSION IS OUR WARFIGHTERS' FUTURE



PEO GCS Overview

9 November 2010

Mr. Scott Davis

**Program Executive Officer,
Ground Combat Systems**

Program Executive Office Ground Combat Systems

PROGRAM EXECUTIVE OFFICE GROUND COMBAT SYSTEMS

PEO GCS PORTFOLIO

6,118 Abrams FoV

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

13,441 M113
6,452 Bradley

3,962 Fire Support Platforms

6,000 Robotic Platforms

(Army & Marine)

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

3,324 Stryker Platforms

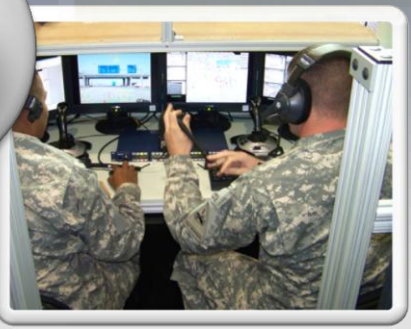
- Stryker Family of 10 vehicles

1,800 Towed Cannons

(Army & Marine)

- M777A2
- M119A2
- M198
- M111 IPADS
- D30

GCV



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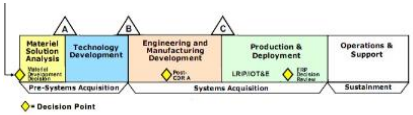
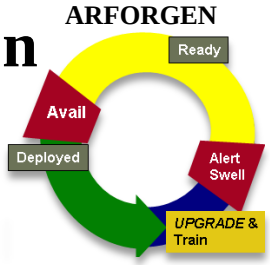
Strategic Environment

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

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



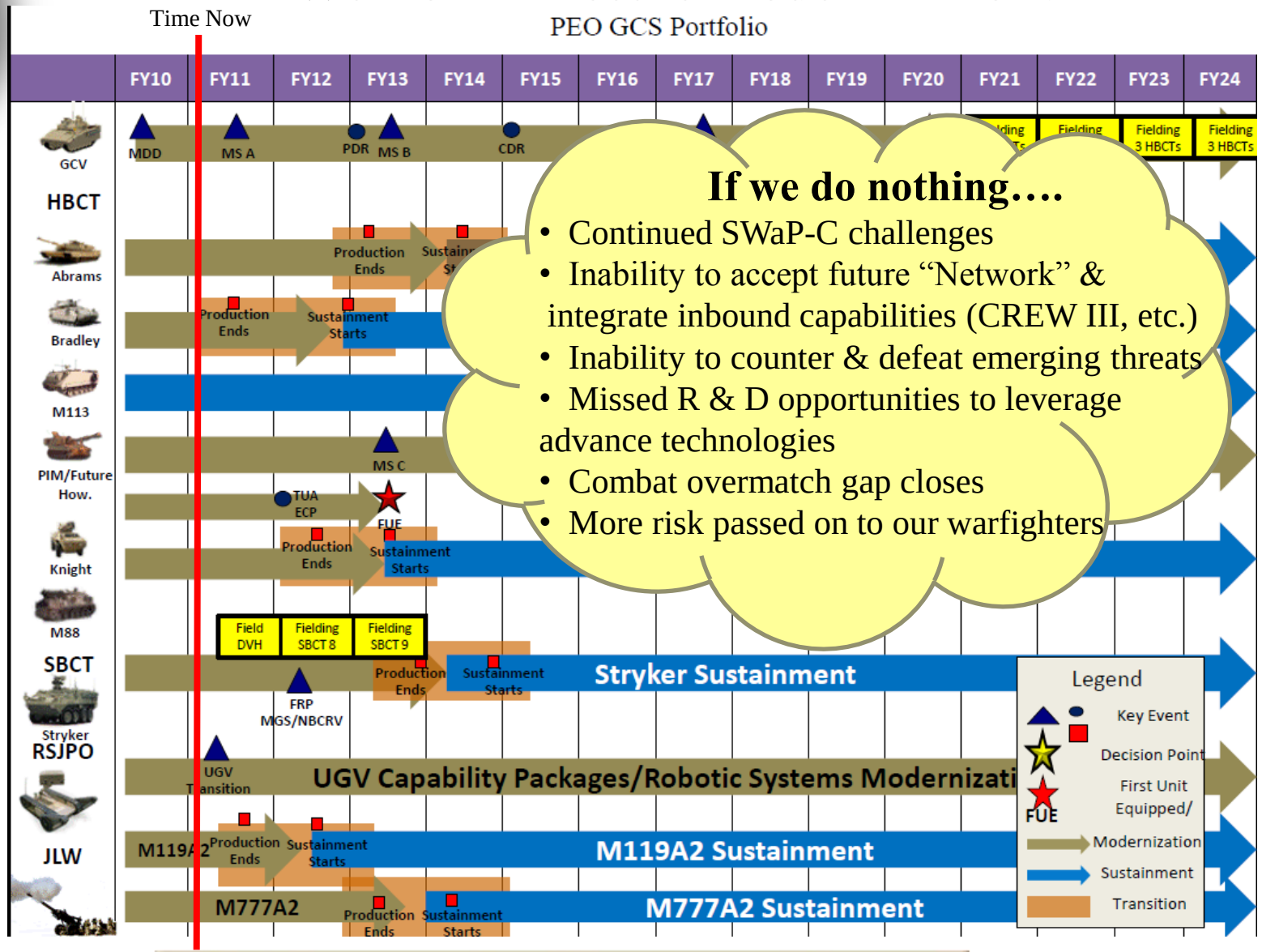
- **Army Modernization**
  - BCT-centric
  - Buy fewer, more often
  - Incremental fielding of capability thru ARFORGEN



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

Uncertainty, Complexity, and Constant Change

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



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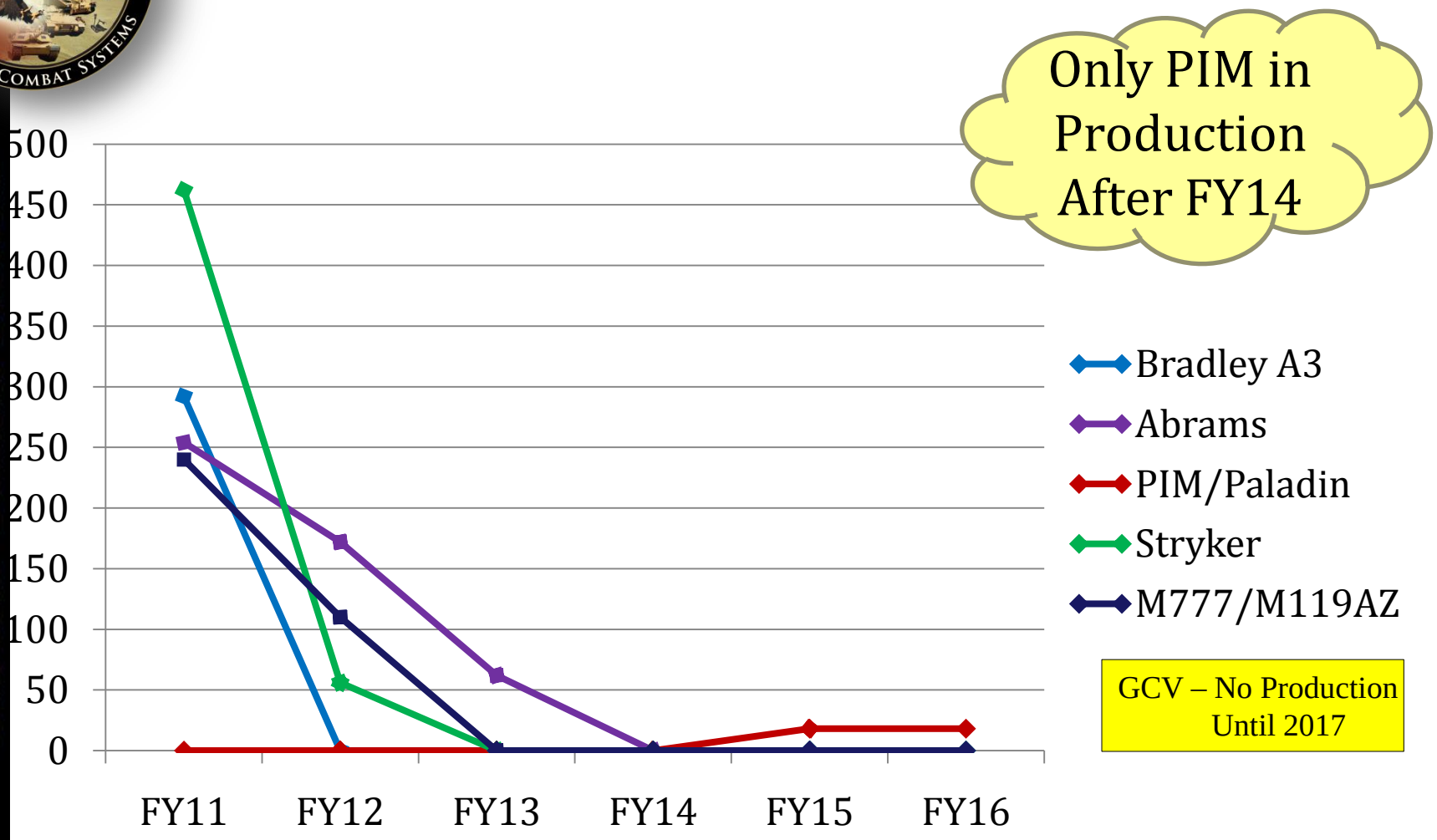
PEO GCS Production Status



Key Implications

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

How do we provide an Integrated BCT Capability?

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Warfighting Functions	Emerging Capabilities	Multiple Materiel Solution Sets
Movement & Maneuver	HMS/GMR	
	Blue Force Tracker II	
Intelligence	VICTORY Architecture	
Fires	Mounted Solider Systems	
Sustainment	Integrated Shot Detection	
Command & Control	Future Combat ID	
	Crew III	
Protection	Advanced Armor	
	And many more. . .	

AoA

Affordability

Solution Set

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Thinking/Operating Like a Business

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

Integrated Capability Management

Today

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

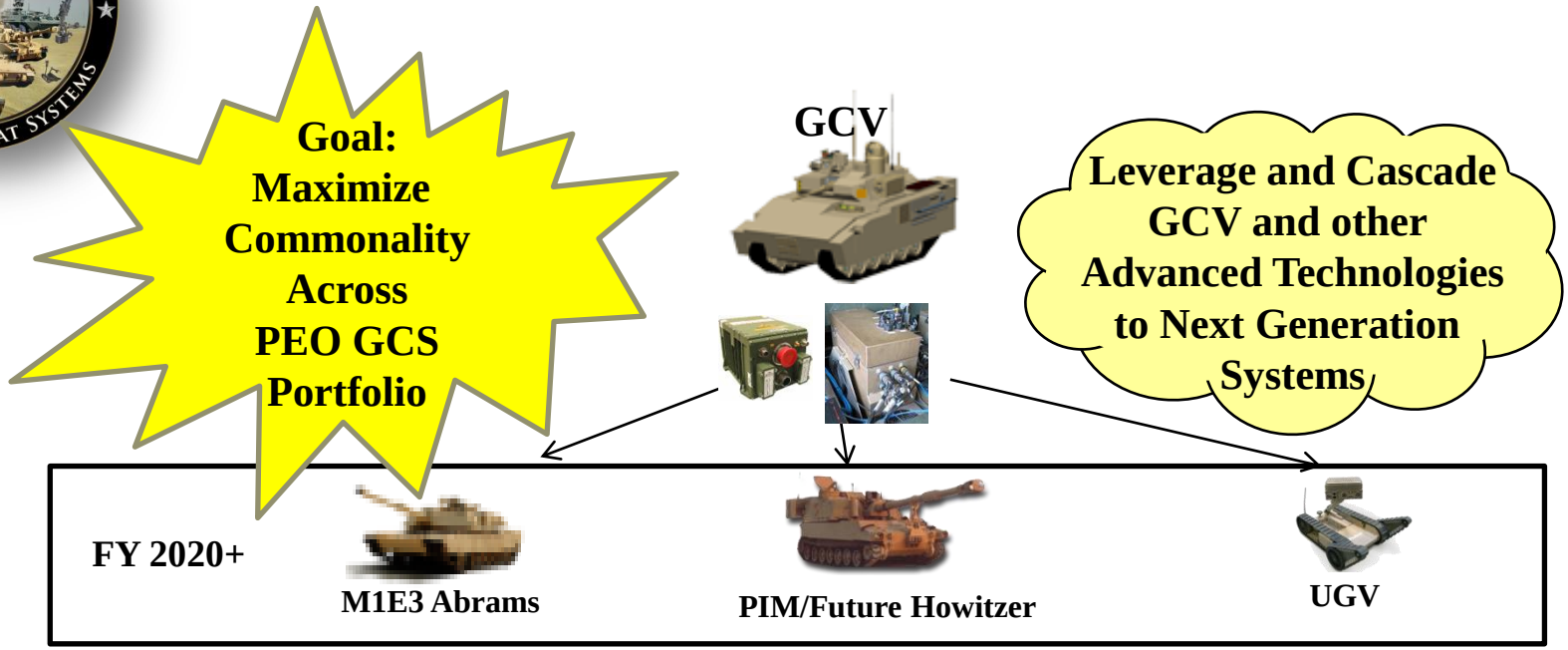
New Approach

The Future

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

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

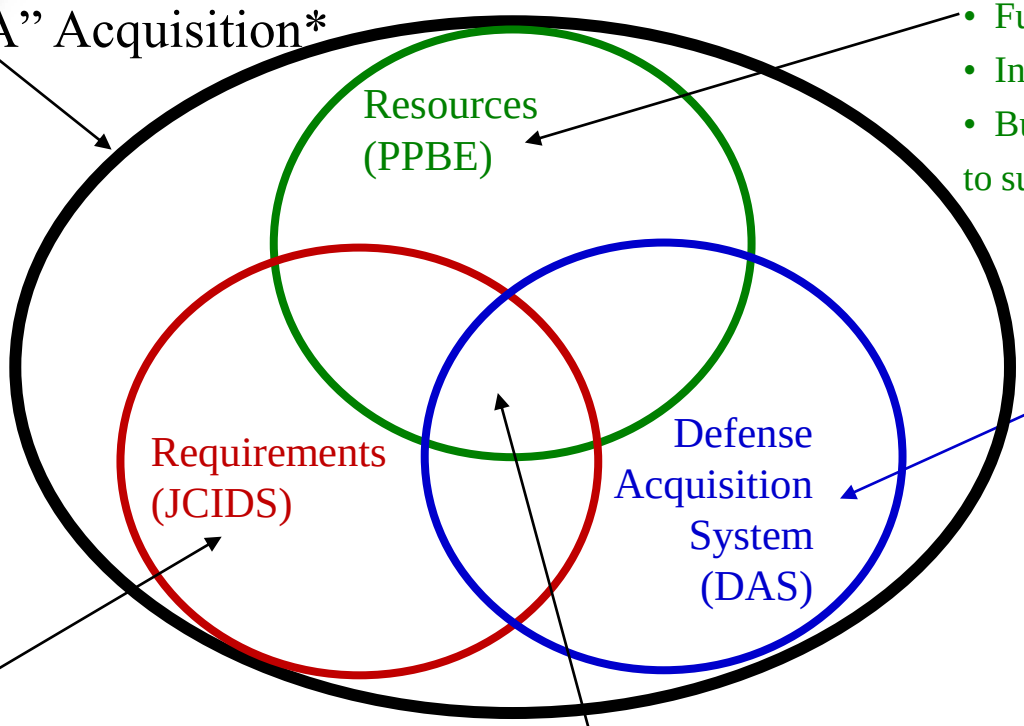
Commonality



Strategy

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

Systemic Issues of Big "A" Acquisition



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

Small "a" Acquisition

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

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

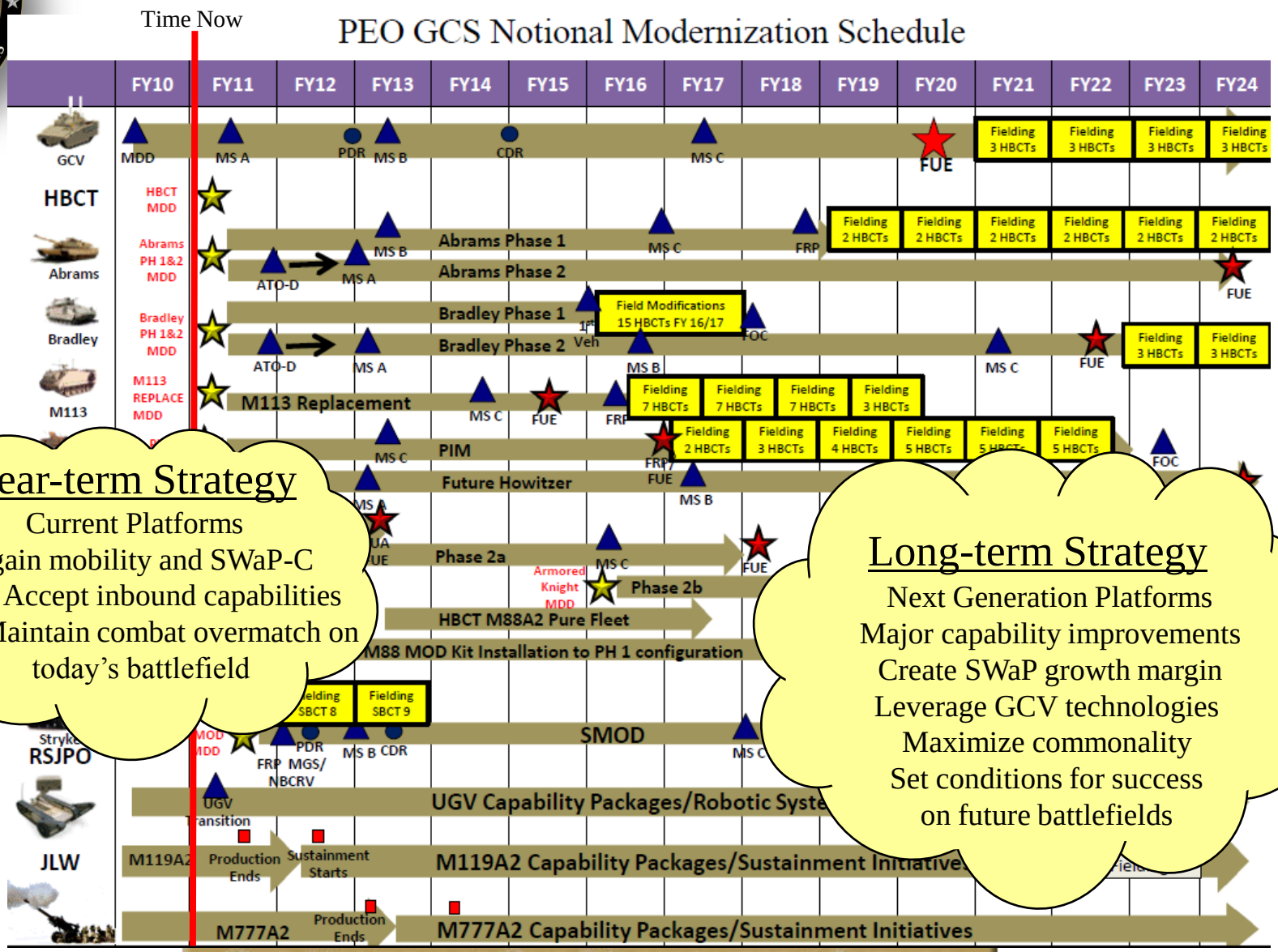
- Lack of inter- and intra-departmental stakeholder coordination and support

*Systemic Issues of Nunn-McCurdy "Class of 2007" Programs

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

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

Where We Are Heading



Near-term Strategy

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

Long-term Strategy

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

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Shaping the Way Ahead

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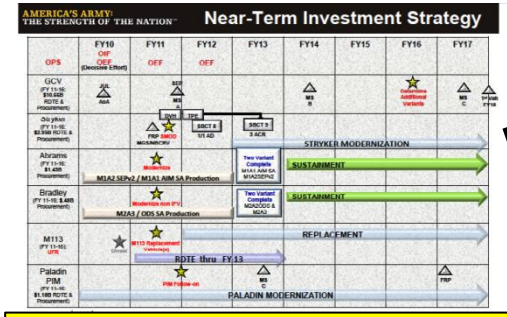
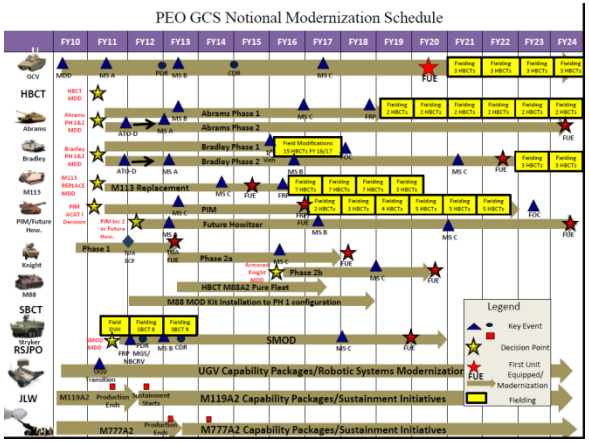
2010 Army Modernization Strategy

2010 Combat Vehicle Capability Portfolio Review



PEO GCS Modernization Campaign Plan



Key Questions to Discuss and Resolve

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

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

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PROGRAM EXECUTIVE OFFICE GROUND COMBAT SYSTEMS

PM Heavy Brigade Combat Team (HBCT)

William Sheehy
Colonel, IN
Project Manager

Heavy Brigade Combat Team

Heavy Brigade Combat Team
PM COL W. Sheehy
DPM Mr. K. Houser

Stryker Brigade Combat Team
PM COL R. Schumitz
DPM Ms. C. Tucker

Lightweight 155MM Howitzer
PM (Acting) Mr. K. Gooding
DPM (Acting) Mr. Chris Hatch

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

PM Abrams	PM Bradley	PM Fire Support Platforms	PD Mounted Maneuver Support	PD Mounted Maneuver Foreign Military Sales
				

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Priorities
Heavy Brigade Combat Team

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

Current Status

- **Average Fleet Age:**

  - Abrams → 2 years

  - Bradley → 3 years

  - Paladin → 11 years

- **PIM is on Schedule**

- **Close to a Decision on:**

  - M113 Replacement

  - Tank & Bradley Improvements

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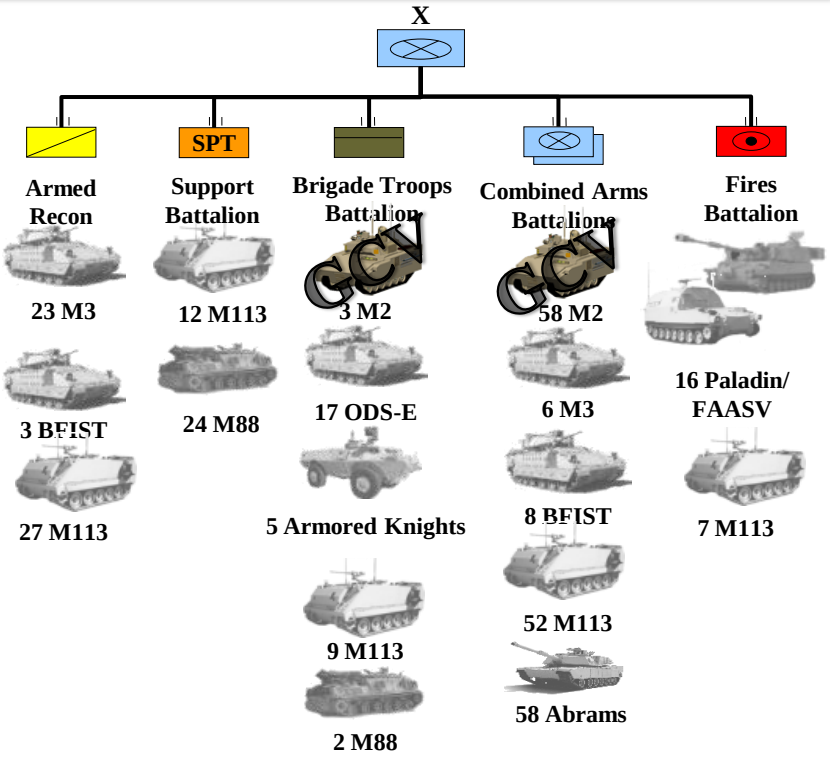
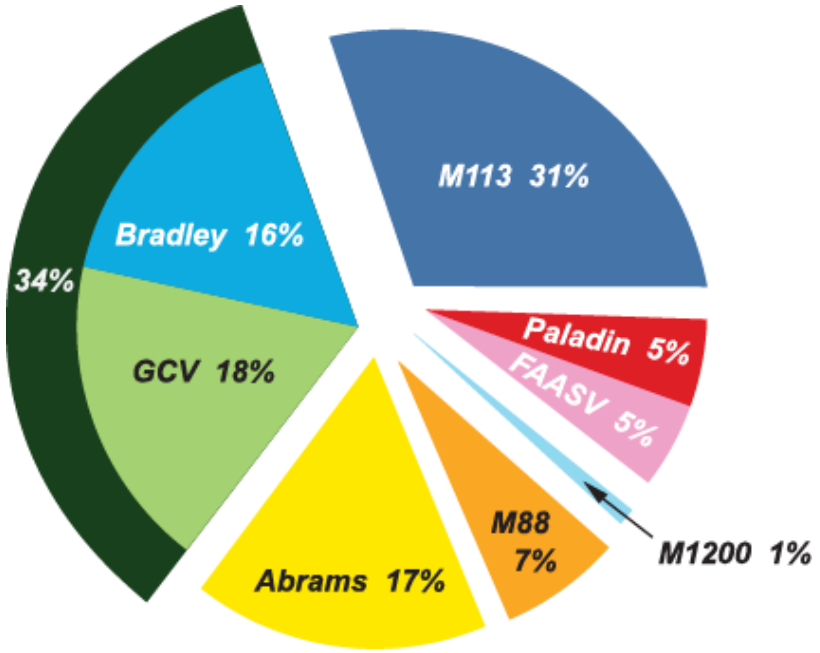
Heavy Brigade Combat Team

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



<u>As a Formation the HBCT Must:</u>

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



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

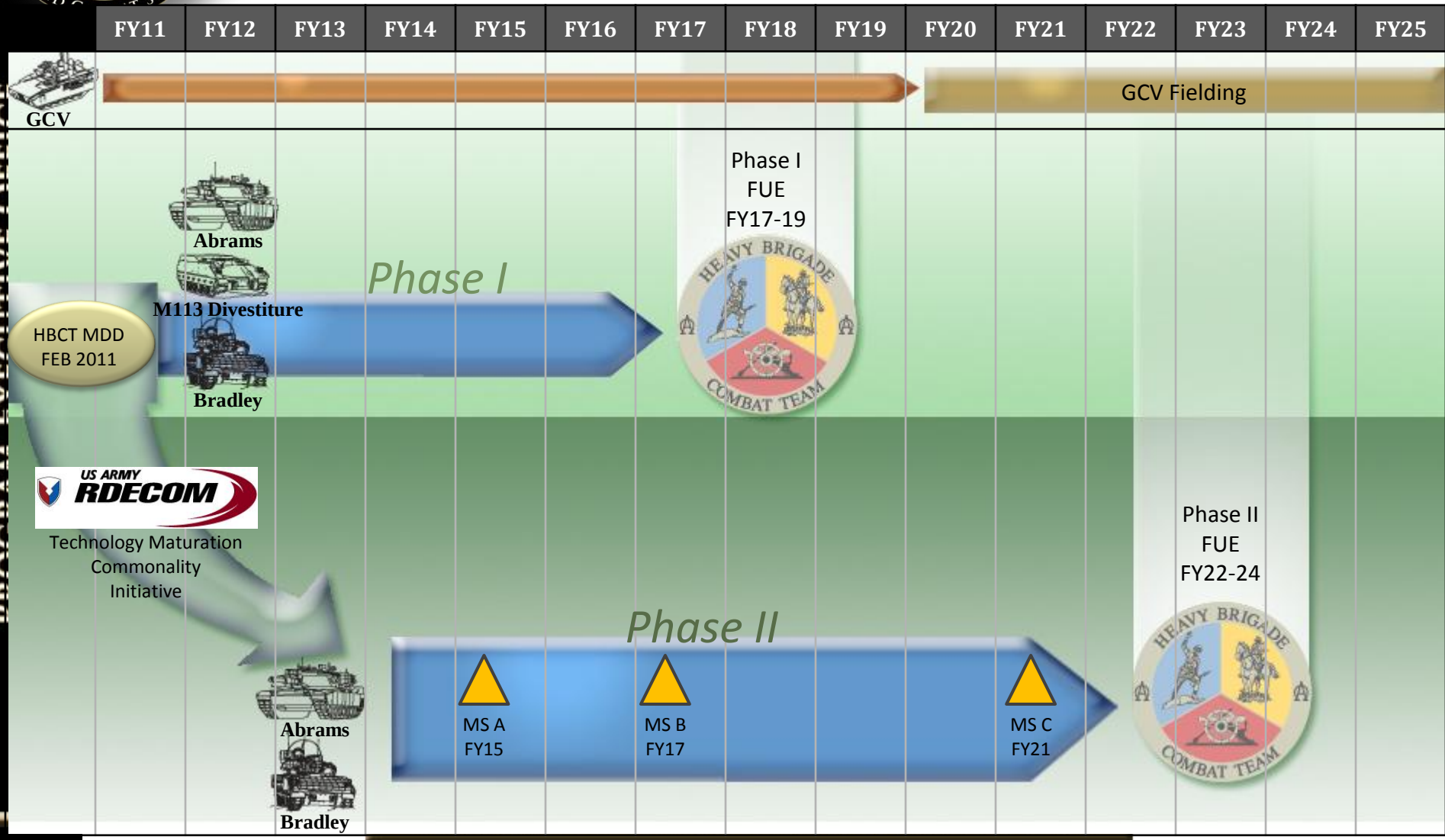
How to Modernize
Single Formation Concept

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

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

Phase I and Phase II begin Simultaneously; Deliver Incrementally

Single Formation Concept



Issues/Concerns

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

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GROUND COMBAT SYSTEMS

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PROGRAM EXECUTIVE OFFICE GROUND COMBAT SYSTEMS

PM Stryker Brigade Combat Team (SBCT)

LTC Schirmer

Lieutenant Colonel, AR

Product Manager

Stryker Family of Vehicles

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Total in a Brigade: 332

Current Fleet Delivered: 3,458

Remaining On Order: 567

Infantry Carrier Vehicle (ICV) - 130

NBC Reconnaissance Vehicle (NBCRV) - 3

Anti Tank Guided Missile (ATGM) - 10

Commonality

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

Medical Evacuation Vehicle (MEV) - 16

Reconnaissance Vehicle (RV) - 52

Bottom Line

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

Engineer Squad Vehicle (ESV) - 13

Mobile Gun System (MGS) - 29

120mm Mounted Mortar Carrier (MCV) - 37

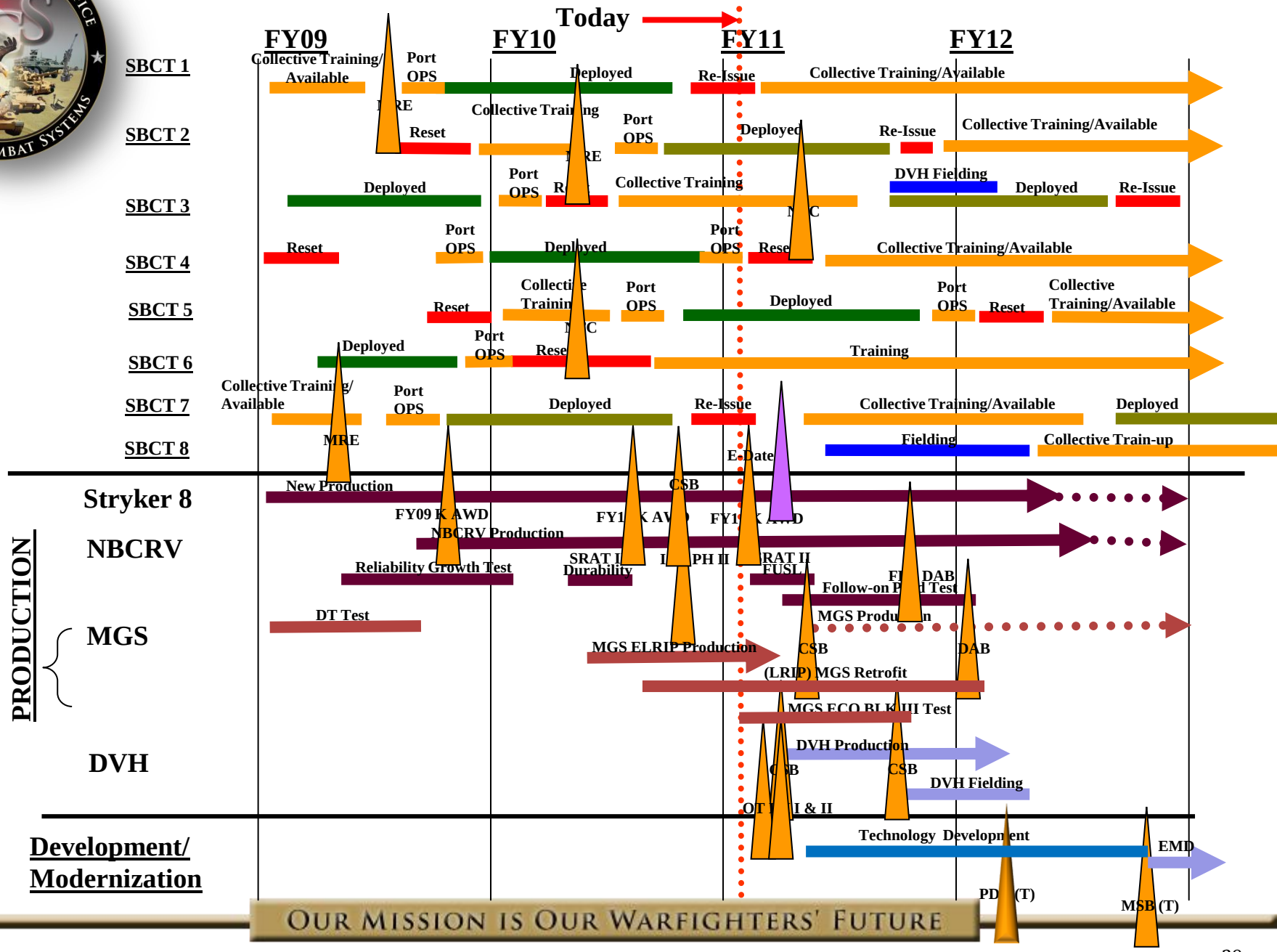
Commander's Vehicle (CV) - 28

Fire Support Vehicle (FSV) - 14

Stryker Opportunities for Industry and Challenges

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

Stryker Fielding & Program Schedule



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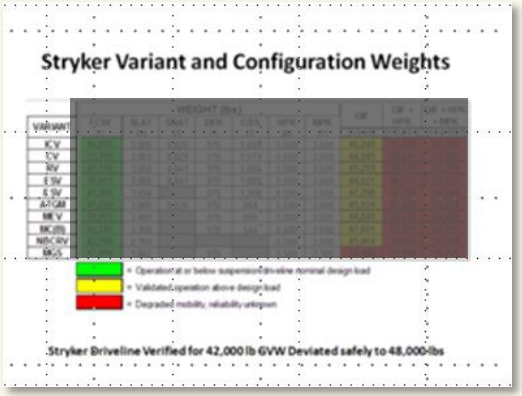
The Need to Modernize

PROGRAM EXECUTIVE OFFICE GROUND COMBAT SYSTEMS

SPACE

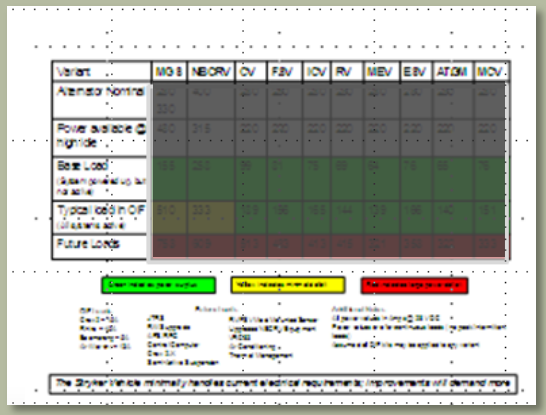
- **Multiple Appliqué solutions added; "Scaleable / Kitable Concept" limited**
- **Kits create both interior & exterior challenges for each carrier variant**
  - **CREW, GSS/MSS, Armor Upgrades**
  - **Additional displays/screens**
  - **2nd/3rd order effects include weight and power**

WEIGHT



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

POWER

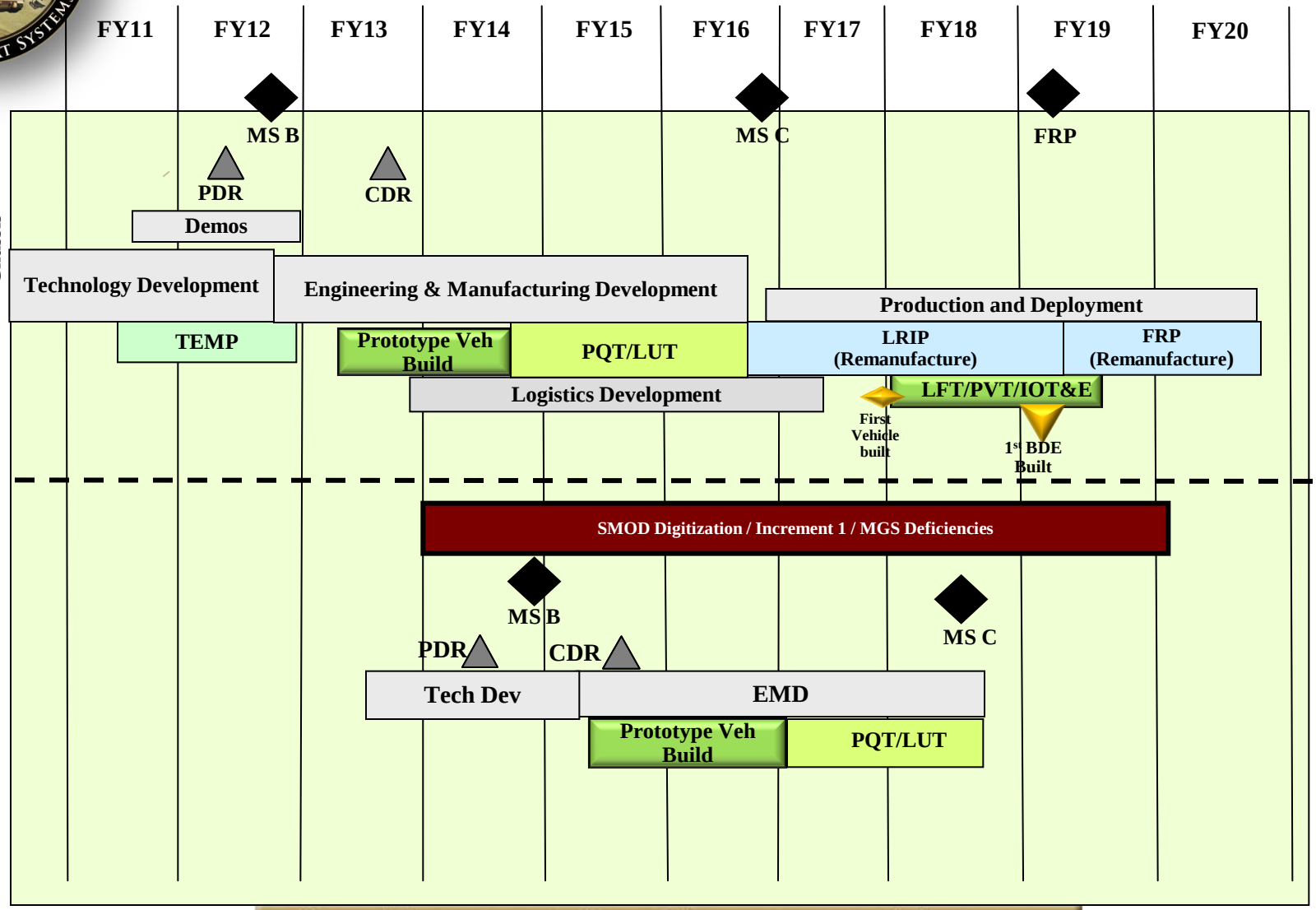


- **OIF kit loads require some systems to be turned off**
- **Current Power Generation cannot meet expected future loads**
- **Silent watch capability impacted**
- **Excess heat impacts both onboard electronics and Soldier's effectiveness**

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

A Notional Upgrade/Modernization COA

Increment I MS C in FY 16
Increment II MS C in FY18



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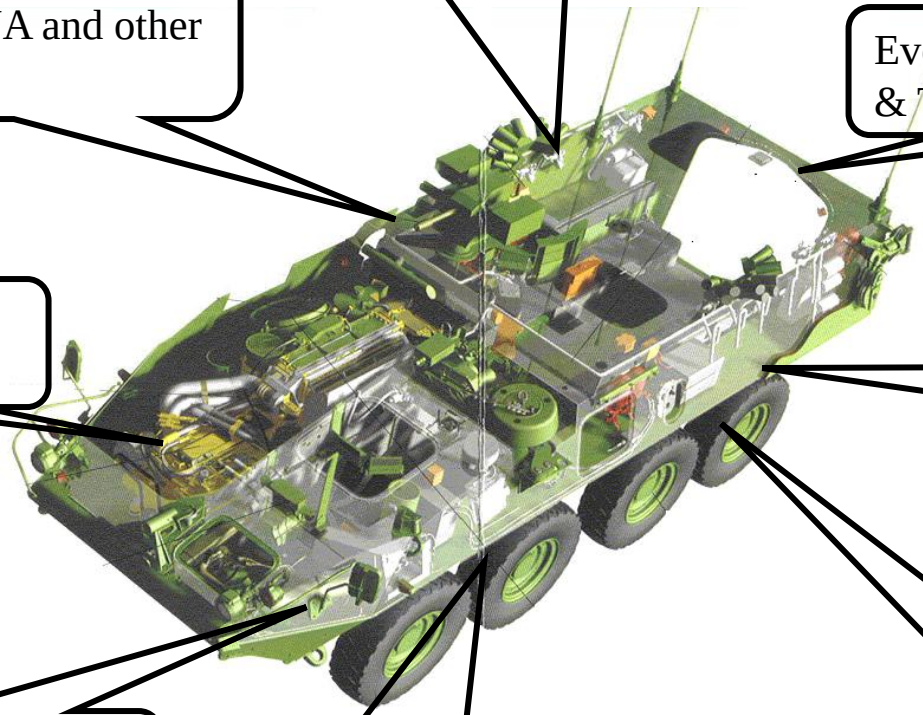
Inputs Driving Modernization



Remaining interoperable at the Joint level

Address capability gaps identified in CNA and other analysis

Evolution of Threat devices & TTP

Current Fight Upgrades

Cap Packages /Spiral Technologies

Improving Crew efficiency and effectiveness

Current & projected increases in Power Consumption

Increased Weight growth

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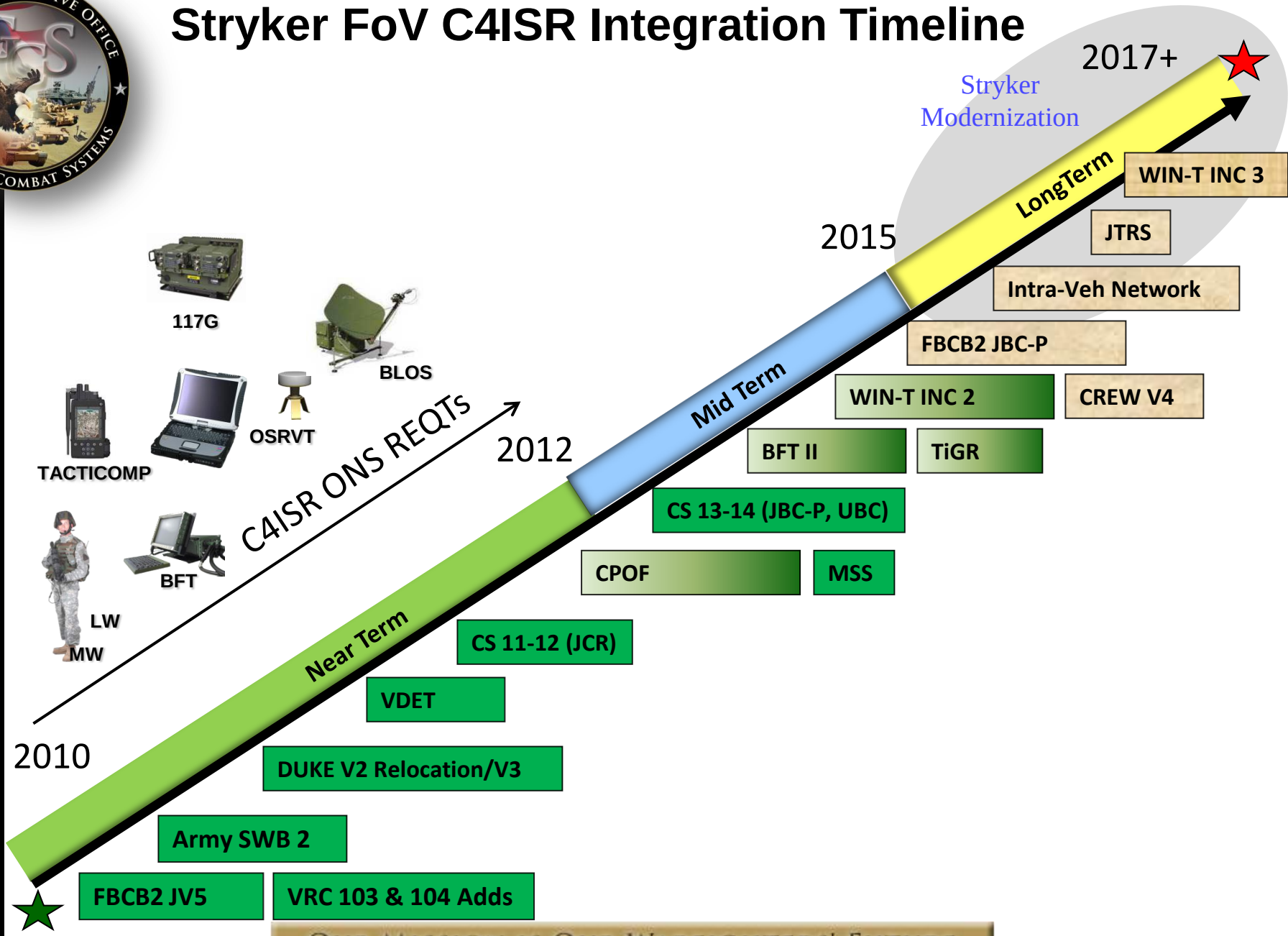
Stryker FoV C4ISR Integration Timeline



Stryker Modernization Plan (Core Enablers)

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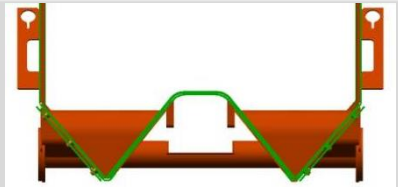
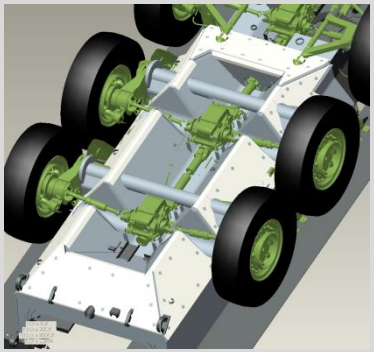
Re-capitalization / Re-Use

Chassis

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



Double V Hull Concept

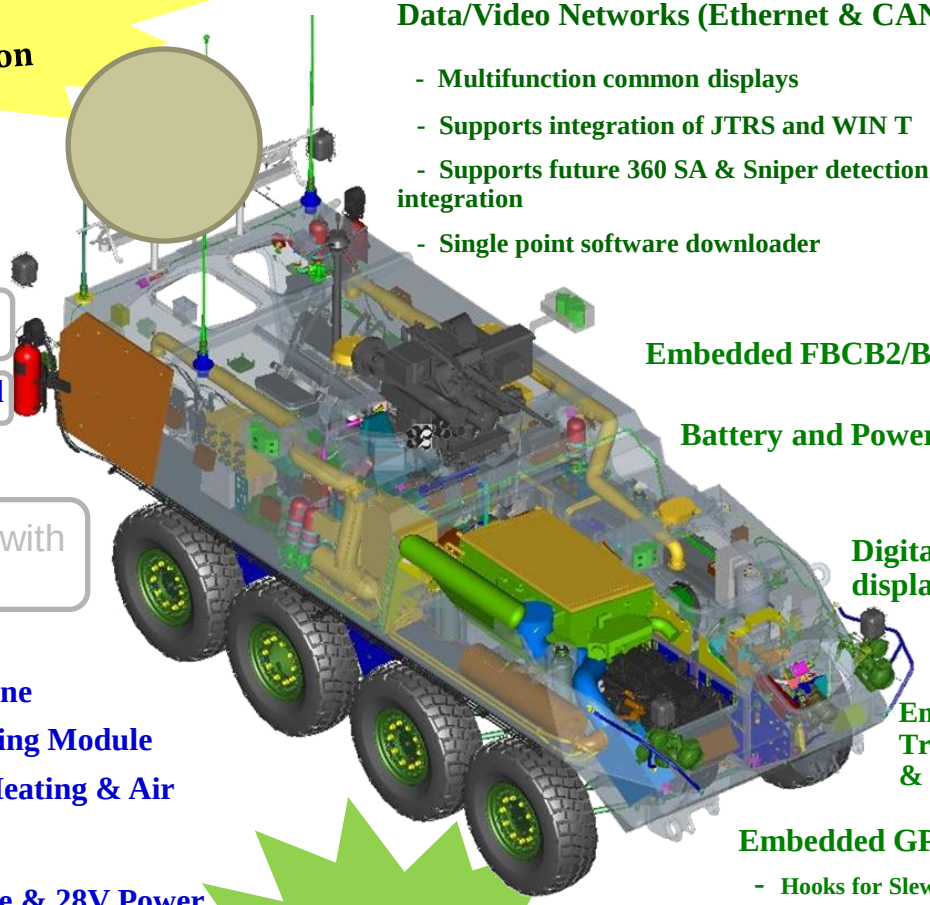


DVH (TPE)
- 5.5 Driveline
- Reinforced tires

Digitization (Chassis Common)

Data/Video Networks (Ethernet & CAN)

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



Embedded FBCB2/BFT

Battery and Power Mgt

Digital drivers display

Embedded Training & External Port

Embedded GPS and INS
- Hooks for Slew-to-cue and Far target location

Condition Base Maintenance
- Embedded Diagnostics
- Portable Maintenance Aid

Common with DVH

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

Time Capability Phased Program?

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

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LW155 JPMO

9 November 2010

Mr. Keith Gooding
JPM, LW155
973-724-4427
keith.t.gooding@us.army.mil

JPMO-LW155 - About Us

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

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JPMO-LW155 - Portfolio

M777A2

M198

M119A2&E1

D30

Projected End State Total (AAO):

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

Gun Laying and Positioning System (GLPS)

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

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M777A2 Howitzer

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System Description

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

Key Requirements/Performance

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

Production/Sustainment Schedule

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

Modernization Strategy

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

M119A2 Howitzer

PROGRAM EXECUTIVE OFFICE GROUND COMBAT SYSTEMS

System Description

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

Key Requirements/Performance

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

Production/Sustainment Schedule

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

Modernization Strategy

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

M111 IPADS

PROGRAM EXECUTIVE OFFICE GROUND COMBAT SYSTEMS

System Description

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

Key Requirements/Performance

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

Production/Sustainment Schedule

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

Modernization Strategy

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

Legacy Systems

PROGRAM EXECUTIVE OFFICE GROUND COMBAT SYSTEMS

System Description

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

Key Requirements/Performance

120 each M198 155mm w/ ASL/BII and other equipment
4 cases
Case 1 and 2 = 54 / 66 guns AS IS = 120 guns
Excess Defense Articles (EDA) Grant Transfer
Case 3 IQ-B-UDC – 54 guns rebuilt @ RIA
Case 4 GX-B-ZAB – 66 guns rebuilt @ RIA
Effort to occur through FY11 and Fy12

Production/Sustainment Schedule

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

Modernization Strategy

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

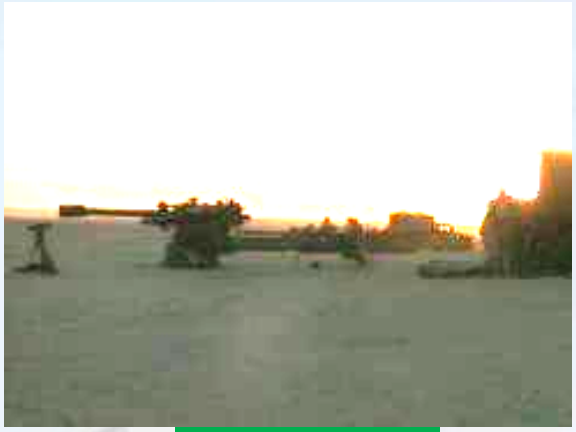
Summary

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

Lightweight 155mm Towed Howitzer Portfolio

M777A2

M198



M119A2&E1

D30

Projected End State Total (AAO):

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

Gun Laying and Positioning System (GLPS)

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

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

OUR MISSION IS OUR WARFIGHTERS' FUTURE

BRIEF TO COMBAT VEHICLE CONFERENCE

LtCol David Thompson, Project Manager



9 November 2010

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

Evolution of Ground Robotics in Combat

- Sustainment, Modernization, Interoperability and Modularity

2004
162 systems
- No single vendor could produce 162
- 5 vendors, multiple configurations
- Joint effort, EOD focused

2005
1800 systems
- Robot's proven ability to save lives
- Expansion beyond EOD mission (Countermine, Security)
- Agreements w/ AMC and REF

2006
4000 systems
- Engineers and Infantry
- Route clearance, Explosive detection & Weaponization development

2007
5000 systems
- Special Forces robot applications assessed
- Route clearance, Explosive detection & Weaponization on battlefield

2008
6000 systems
- Maneuver elements
- Range extension
- CBRNE detection
- Persistent surveillance
- RC HMMWV
- More capable payloads

2009-2010
7000 systems
- Smaller platforms
- Enhanced battery life
- Enhanced commonality
- Remote deploy
- More capable payloads

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

Current Operations

- Robotic systems have functioned properly and reliably during OIF/OEF
- RS JPO has fielded over 7000 ground robotic systems since 2004
- Warfighters are generally satisfied with current UGVs, but priorities are improvements in size, weight, and power consumption

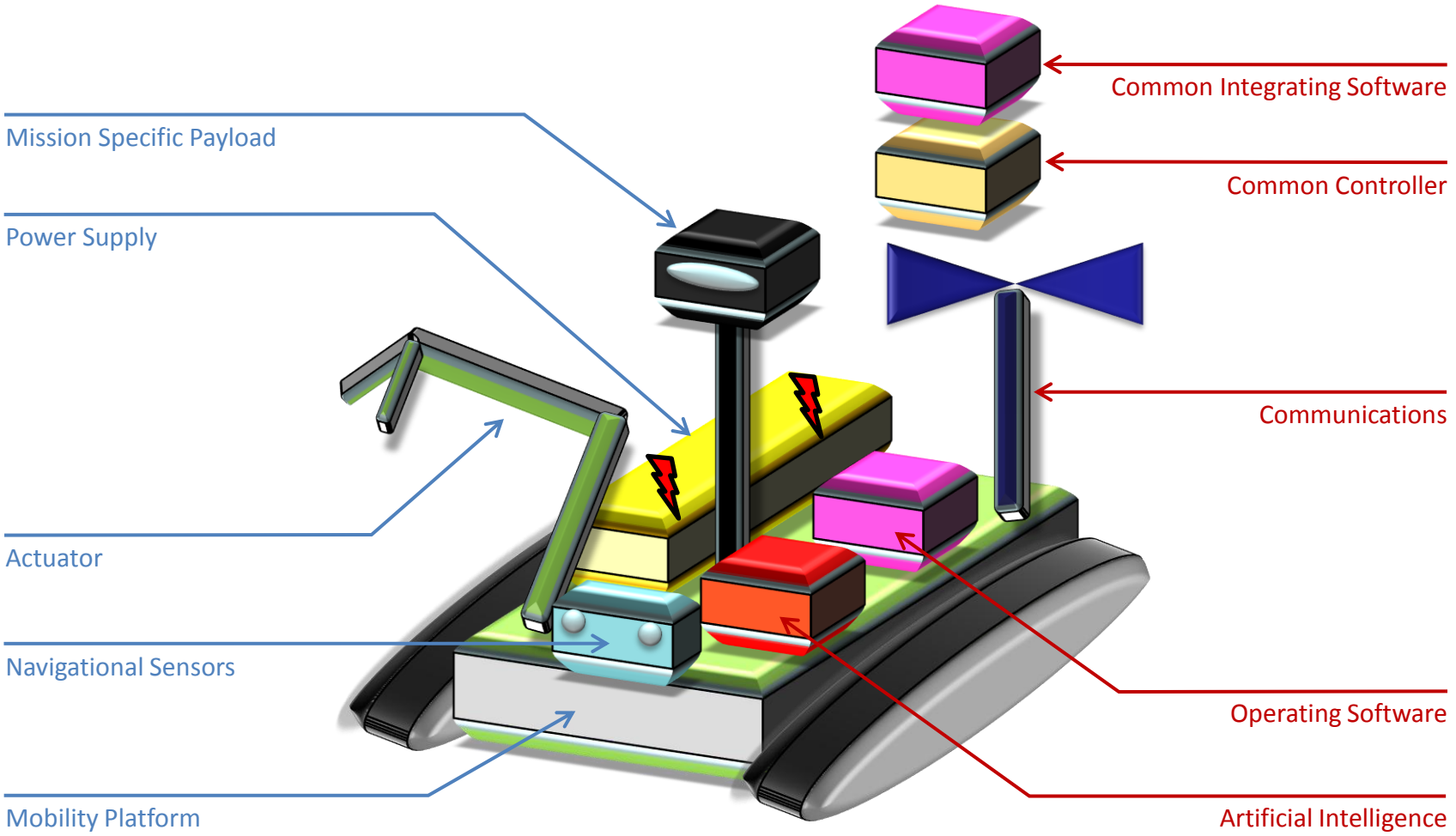
- What the Soldier wants:
  - More autonomy to reduce workload
  - Extended standoff ranges
  - Common controller
  - Increased endurance
  - Increased dexterity & agility
  - More capable/compact payloads
    - » Cameras, comms, IED detection, etc
  - MORE systems!

Modularity

ROBOTIC SYSTEMS JPO

Common Within Platforms

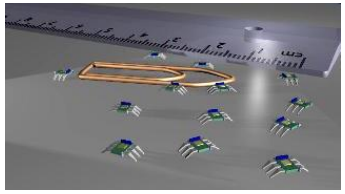
Common Across Platforms



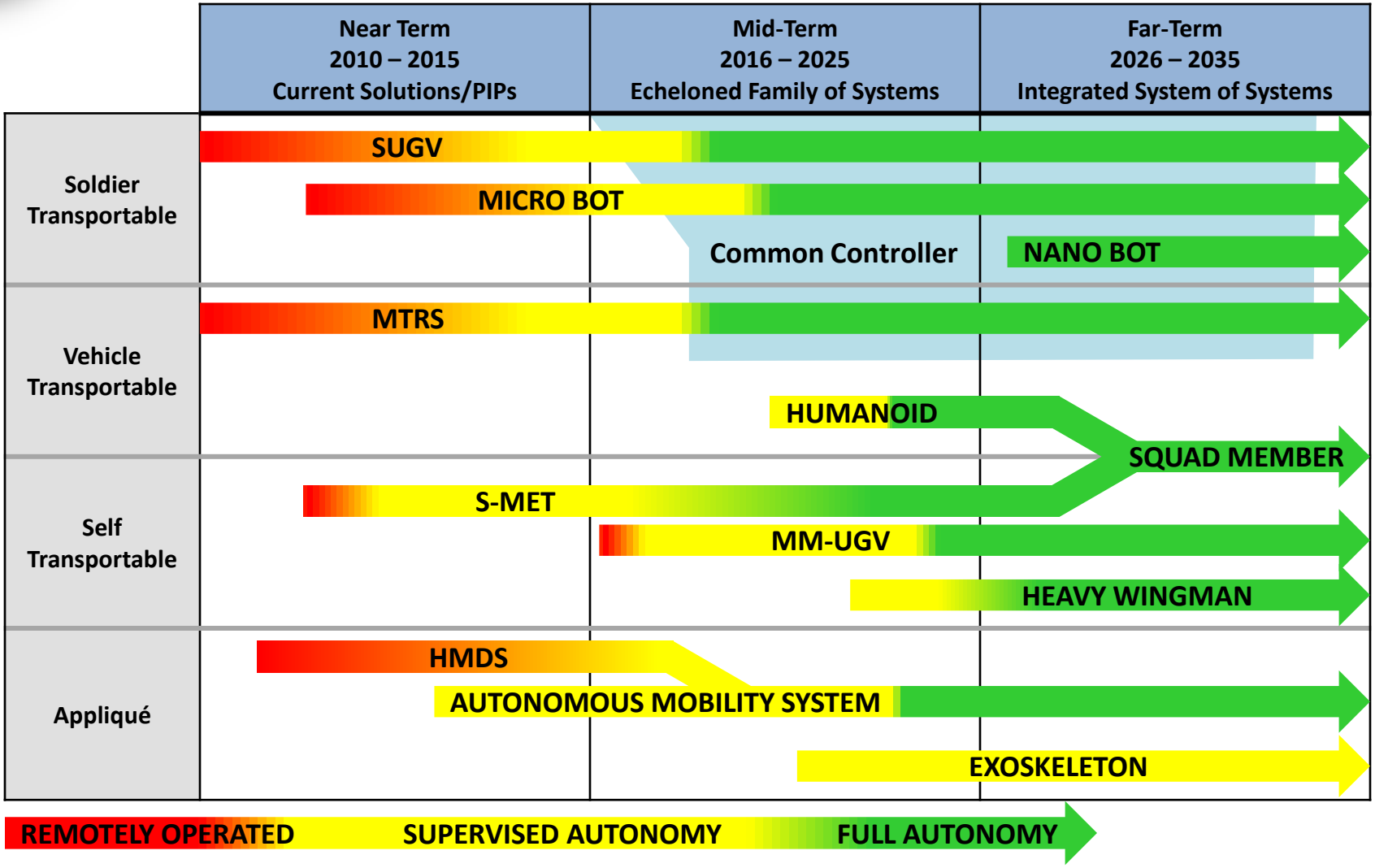
ROBOTIC SYSTEMS JPO

Ground Robotics Capability Sets

Photos for CDDs and Efforts are Notional Representations

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

Army UGV Capability Timeline
Supported by the UGV Campaign Plan



Opportunities for Industry

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

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

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


Panel
Discussion
Program Executive Office
Ground Combat Systems
Our Mission is Our Warfighters' Future

PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS

HBCT
COL W. Sheehy bill.sheehy@us.army.mil
RS JPO
LtCol D. Thompson (USMC) david.c.thompson6@us.army.mil
SBCT
COL R. Schumitz robert.w.schumitz@us.army.mil
LW 155
Mr. K. Gooding keith.t.gooding@us.army.mil