



Program Executive Office Ground Combat Systems (PEO GCS)

Advance Planning Brief for Industry (APBI) Panel

Mr. Scott Davis

PEO GCS

28 OCT 2011



Agenda

- PEO GCS Portfolio Overview
- GDLS Insights & Opportunities
- BAE Insights & Opportunities
- JPO Robotics Overview
- GCS Readiness & Sustainment

Mr. Scott Davis

Mr. Mike Cannon

Mr. Adam Zarfoss

LtCol Dave Thompson

Mr. Jerry Figueroa



PEO GCS Portfolio Overview

APBI

Mr. Scott Davis

PEO GCS

28 OCT 2011



Program Executive Office Ground Combat Systems

4,000 Robotic Platforms



- (Army & Marine Corps)**
- XM1216 SUGV
 - M160
 - MARCbot
 - PackBot Family
 - TALON Family
 - Mini – EOD (SUGV-310)

3,894 Stryker Platforms



- Stryker Family of 10 vehicles



2,338 Abrams Tanks*

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



**4,559 Bradley*
465 Knight**

PEO GCS PORTFOLIO

969 Self-Propelled Howitzer Systems*



Ground Combat Vehicle



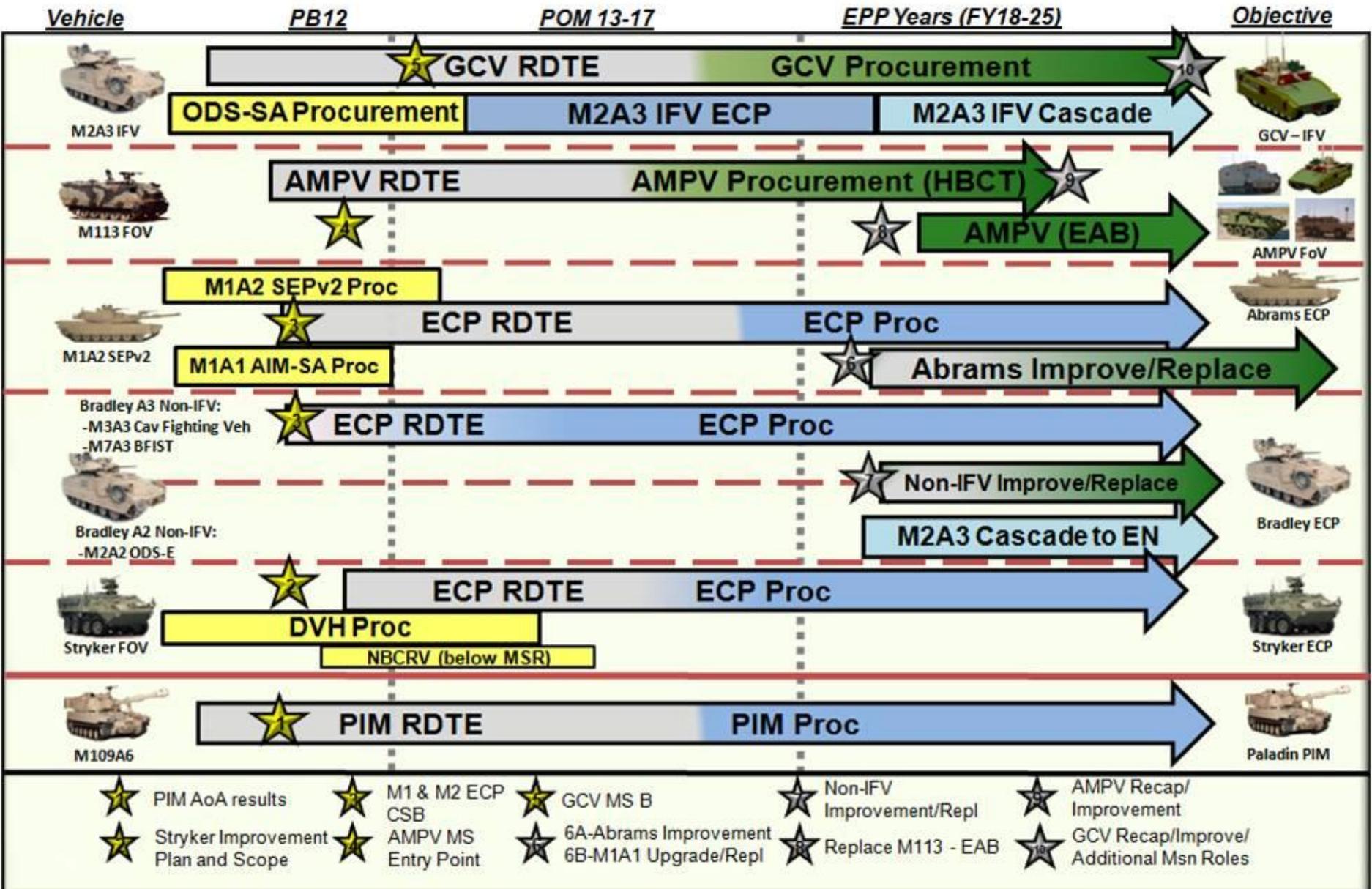
**3,901 M113 FoV*
1,056 M88 Recovery Vehicles***



* Does not include systems in long term storage



Combat Vehicle Modernization Strategy





PEO GCS Modernization Schedule (Pre Decisional)

	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21
 GCV IFV	 MS A		 MS B				 MS C			 GCV IFV FUE	
 Abrams		 ECP Contract Award	 PDR	 CDR		 Production Contract Award				 Abrams ECP FUE	
 Bradley		 EMD Contract Award	 PDR	 CDR		 Production Contract Award	 Bradley ECP FUE				
 AMPV		 MDD		 MS B			 MS C	 AMPV FUE			
 Stryker		 NBCRV FRP									
 PIM	 IPR DAB		 MS C				 PIM FUE				
 SUGV			 MS C/FRP								



Key Takeaways for Industry

- Upcoming recap and modernization efforts across ground vehicle portfolio provide unique opportunity
- Leverage IRAD with RDECOM and focus efforts on emerging requirements
- Full spectrum of support and collaboration required between government and industry for R&D and throughout the lifecycle
- Collaboration among all stakeholders essential to making commonality a reality
- Stay connected. Ensure the “right hand knows what the left is doing” so we can work together and achieve our goals
- Budget, economic and political environment require innovative ideas/solution sets – the “old ways” are not going to work in this changing environment (Super Committee, draw down, etc....)



OUR MISSION IS OUR WARFIGHTERS' FUTURE



GENERAL DYNAMICS

Land Systems



Ground Combat Systems

Mike Cannon, SR VP

APBI – 28 October, 2011



HBCT

- Abrams Continuance
 - 4 Congressional Committees have marked in favor of continuance
 - Indication favors a strong go forward
- Abrams Modernization is gaining a strong foothold
 - Not totally defined yet

SBCT



- Stryker Bundling Package
 - 292 Additional Stryker Double V Hull (DVH)
 - 100 NBCRVs
 - MGS Conversion Program tied to bundling package
 - Offers the Government Significant Savings
- Stryker 2012 Sustainment continues at 2011 levels through 2012
 - Reset opportunity in late 2012
- Stryker Modernization moving along
 - In Definition Stage

Major International Programs

- Position GDLS as preferred KSA supplier for opportunity with Royal Guard
- Secure KSA awards for Ministry of Defense & Aviation SWORD M1A2S Program
- Secure award for Egypt Increment 11 co-production & position for Increment 12



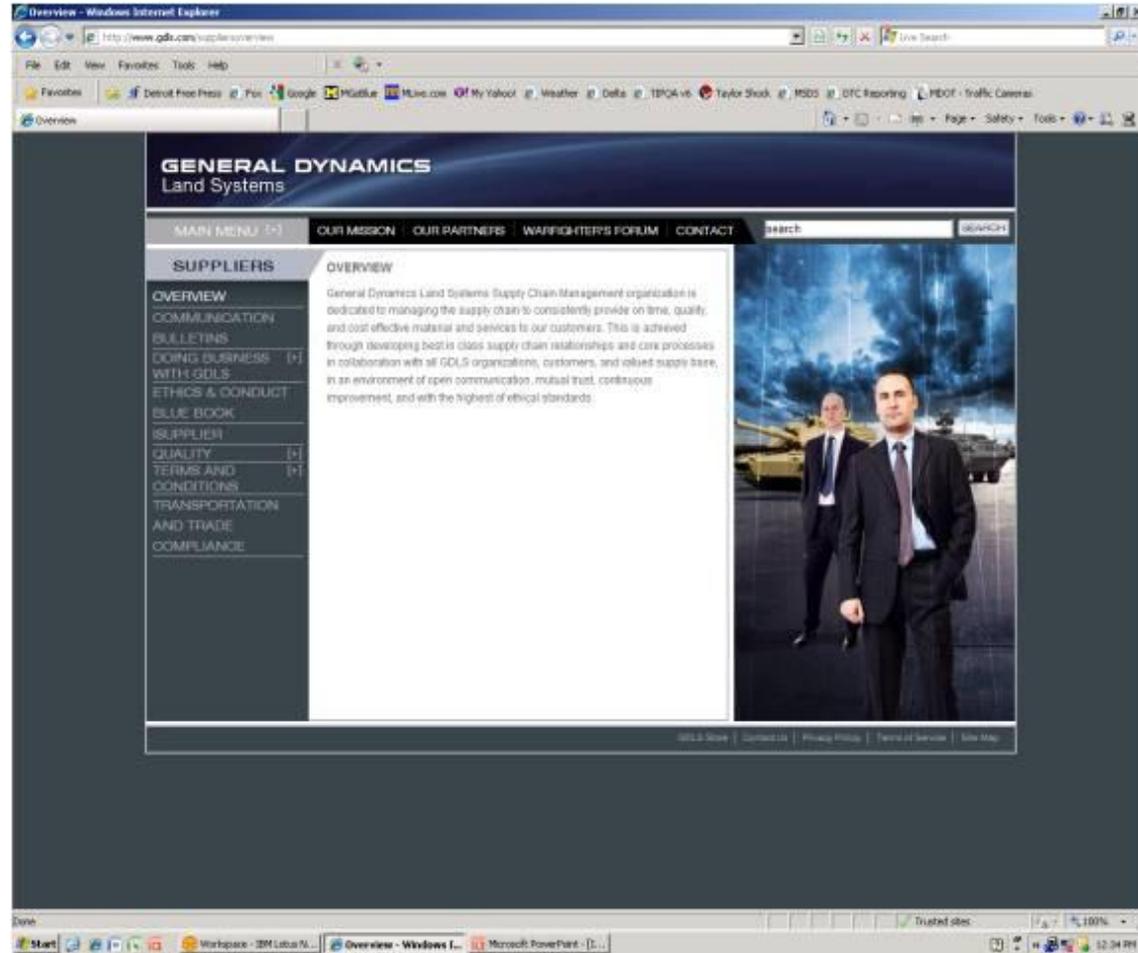
GDLS/SCM Website

Supply Chain Management Home Page:

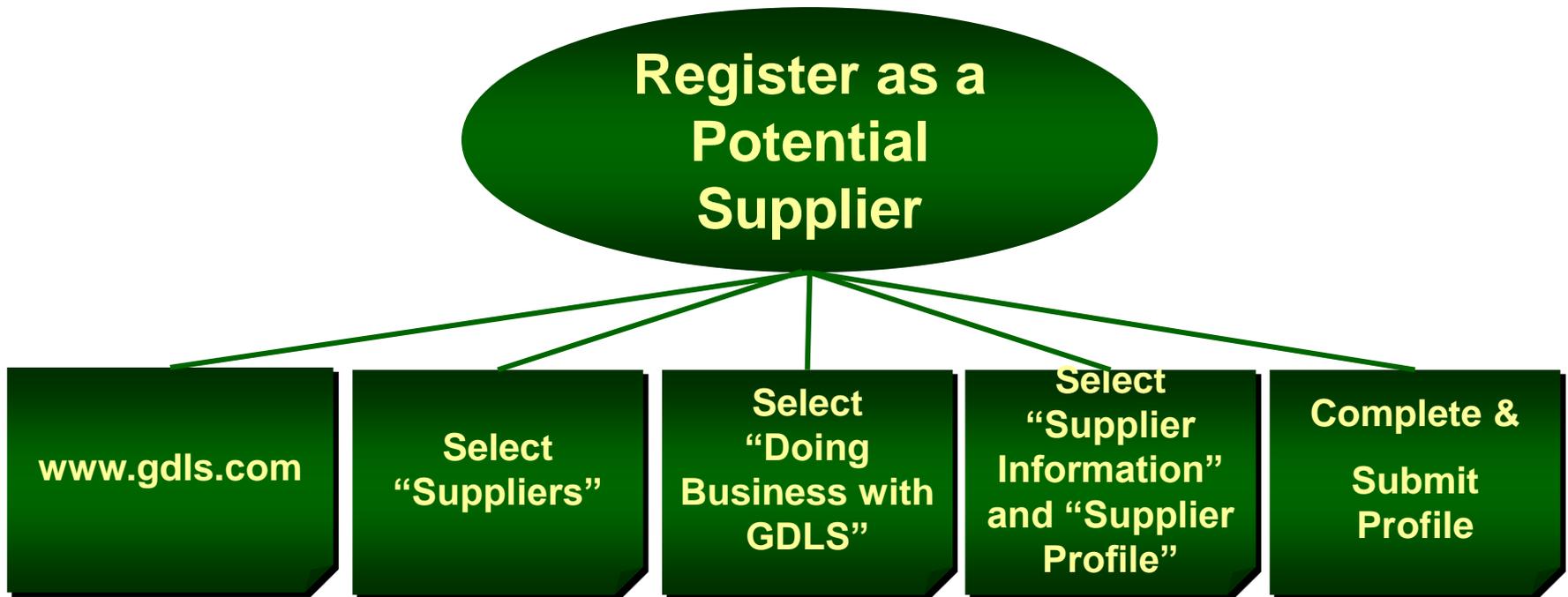
<http://www.gdls.com/suppliersoverview>

Here you will find links to:

- Communication Bulletins
- Oracle Computer System
- Supplier Manual
- General Bidders Instructions
- Doing Business with GDLS
- Purchase Order Clauses, Terms & Conditions
- General Marking Requirements
- Transportation Routing Instructions
- Control of Government-Owned Property
- Quality Instructions
- Additional Information
- Supplier Container Labeling



Supplier Profile



Gateway to General Dynamics Land Systems



MANEUVER COLLABORATION CENTER



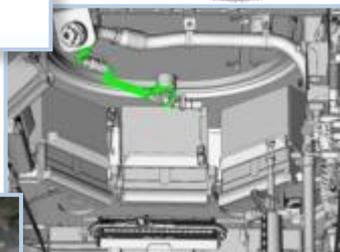
Collaboration and Innovation Using the mc²

Growth Opportunities Start with Collaboration

New Solutions for Our Clients



**Stress Wave
Analysis (SWAN)**
NORTHROP GRUMMAN



**Luminous Hatch
Handle**



**Stryker Emergency
Oxygen and Light**



E-stop



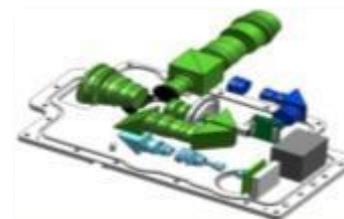
Solutions for New Clients



Technology Maturation Collaboration



**Stirling Cycle Auxiliary Power
Unit for Abrams**



**Advanced Eye
Protection from
Lasers**



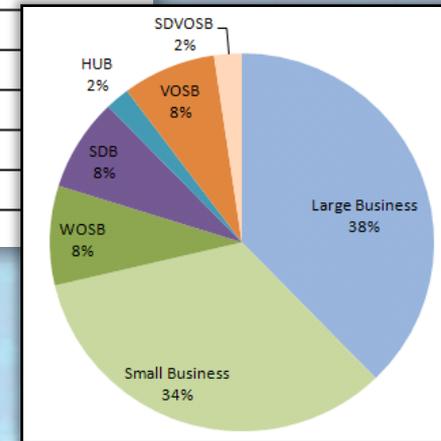
Genshock



mc² Supplier Profile

- Individual Membership
 - 877 U.S. Supplier Members
 - 86 Foreign Supplier Members
- Supplier Company Membership
 - 617 Companies
 - 229 Potential New Suppliers
 - 388 Current GDLS Suppliers
 - 38% Large Business; 62% Small Business
 - 42% State of Michigan
- 43% of current top spend GDLS suppliers are registered in mc²

Country of Citizenship	# of Supplier Members
Albania	1
Austria	1
Bangladesh	1
Canada	22
China	3
France	1
Germany	9
India	3
Israel	30
Italy	1
Netherlands	1
New Zealand	1
Norway	1
Romania	1
United Kingdom	9
US Minor Outlying Island	1



- Small Business Diversity Participation Aligns with Corporate Goals
- Opportunity for Increased Networking Among Current Supply Base

Michigan Supply Base

- General Dynamics Land Systems
 - 643 Suppliers
 - \$673.6M Spent in 2010

-  Michigan Supply Base
 - 258 Members from 179 Companies
 - Current Suppliers:
 - 169 Members from 106 Companies
 - 71 Small Michigan Companies
 - 31 Small Diverse Businesses
 - Potential Suppliers:
 - 89 Members from 73 Companies
 - 32 Small Michigan Companies
 - 10 Small Diverse Businesses



**GD Corporate
2010 MI Spend**

Other GD Divisions

- 951 Suppliers
- \$259.4M Spent

General Dynamics
Corporation

- 1,594 Suppliers
- \$933.0M Spent

What's Next for MC² ?

- Unique Automotive Test Capability across GDLS Programs
 - Largest Vehicle Dynamometer in the United States (72 Tons Weight Class at 70 mph)
- Armament System Development
 - Gun/Turret Integration, Automatic Ammunition Loading and Fire Control Integration
- Project on Schedule
 - Ground Breaking Jun 2011
 - Occupancy Jan 2012



World Class Capability To Meet Customers' Needs

Visit our  website

www.gdls.com/mc2

Advanced Planning Brief for Industry BAE Systems

October, 2011



BAE Systems, Land & Armaments

Land & Armaments provides design, development, production, through-life support and upgrade of armored combat vehicles, tactical wheeled vehicles, naval guns, missile launchers, artillery systems, munitions as well as military and law enforcement products

We are the company that...

- Has been a technology partner to the U.S. military since World War I
- Provides over 80% of the combat vehicles for the HBCT
- Delivered the first hybrid electric combat vehicle to the U.S. Army in 2008
- Shot a precision guided 155-mm naval artillery round to a range of 63 NM
- Developed the U.S. Navy's electromagnetic rail gun that set the world record
- Built the vehicle that pulled down the statue of Saddam Hussein
- Built over 80,000 M113s, over 6,000 Bradleys, over 6,000 howitzers, over 5000 MRAPs, and over 1500 specialized recovery/engineering vehicles

Products: Ground combat

Supporting Soldiers & Marines:

Core Competencies:

- Combat vehicle survivability
- Modeling and simulation
- Systems integration
- Rapid prototyping
- Reliability testing
- Lean manufacturing
- Field support
- Training systems
- Spares
- Auxiliary Systems

Current Force

Bradley Combat Systems



M113 Personnel Carrier Family



M88 Recovery Vehicle



AAV7A1 Family of Vehicles



M109 Artillery Family of Vehicles



Survivable Wheeled Vehicles



Future Force

Joint Light Tactical Vehicle (JLTV)



High Energy Laser Technology Demonstrator



Ground Combat Vehicle



Challenges

- Real issues with viability & sustainability of defense industrial base
 - Break in Bradley & M88A2 production on near-term horizon
 - Timing & materiel solution on AMPV uncertain
 - GCV delay impacts (not discussed due to protest)
 - Impacts being felt today by many of our current suppliers
- Fiscal constraints will drive difficult decisions and increased emphasis on competition throughout the Industrial Base
- Changing acquisition efforts placing more financial risk to OEMs/Industrial Base
- Expectations of shortened cycle times – must reduce “time to market”
- Driving commonality across formation – from components to architecture

Opportunities

- PIM is modernizing our self-propelled Artillery fleet
 - Maximizes automotive commonality with Bradley (via new chassis structure)
 - Sets foundation for growth (e.g. generates 70KW, 600 vdc power)

- Stated need to replace aging M113 fleet with more survivable, sustainable platform (AMPV)
 - Bradley-based platforms under consideration
 - Provides survivability & mobility matching the supported force
 - Commonality a huge benefit to the soldier – and the taxpayer

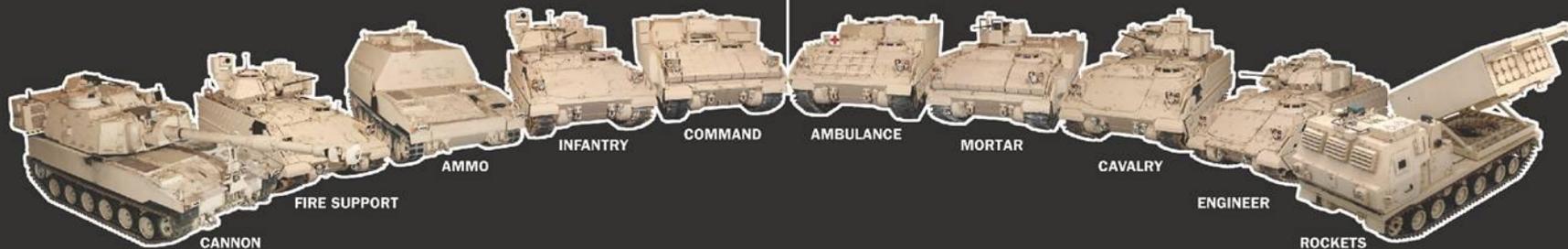
- Bradley incremental upgrades – through ECP process
 - Address SWaP shortfalls
 - Sets foundation for growth - ensure longer-term viability & sustainability

- Others: Pure fleet M88A2; International sales (M2, M113, M109), etc

Take Away

- We are faced with challenging environment – but not without opportunities
- Army's planned improvements provide opportunity to maximize commonality across the formation - a key initiative
- Expect increased opportunities for competition in the supply base – driving for multiple qualified sources
- Fiscal constraints will drive higher reliance on non-developmental solutions – focused internal research & development efforts may pay dividends in the longer-term
- OEMs and entire Industrial Base must develop closer relationships to ensure we are in sync with our customer

Bradley-based Combat Vehicles
**THIS FAMILY IS READY
FOR ANY MISSION.**



Contact BAE Systems: smallbusiness.landa@baesystems.com



UGVs IN THE FIGHT – MAKING A DIFFERENCE

LtCol Dave Thompson, USMC, Project Manager



October 2011

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



Mission

Lead the development, systems engineering, integration, acquisition, testing, fielding, sustainment and improvement of unmanned systems for the Joint Warfighter to ensure safe, effective and supportable capabilities are provided while meeting cost, schedule and performance.

Vision

Continuous improvement of unmanned system capabilities to meet current and future Joint Warfighter objectives.

Robots Currently in Combat

Mini-EOD
(SUGV-310) **(400)**



PackBot Family
(1100)



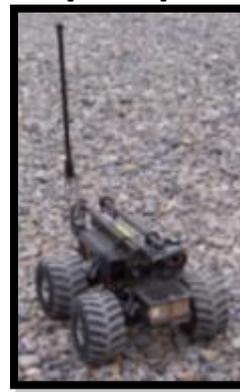
SUGV XM1216
w/Tether **(38)**



TALON Family
(1000)



MARCBot
(350)



M160
(40)



ROBOTIC SYSTEMS JPO



Accomplishments and Warfighter Support

- Robotic Fleet Management
 - Approx 200 robots remaining in Iraq/Kwt, 2200+ robots in Afghanistan
- Stand-off for IED interrogation and blow-in-place
- Deploy and operate from inside vehicles
- Entry control points and perimeters
- M160 Successes
 - Adaptations for new uses
 - Route clearance



Joint Robotics Repair Detachment – Afghanistan



ROBOTIC SYSTEMS JPO



Program Executive
Office Ground Combat
Systems
PEO Mr. Scott Davis

Warren, MI



Marine Corps Systems
Command
BGen Frank L. Kelly
USMC

Quantico, VA



Robotic Systems Joint
Project Office
PM LtCol David Thompson
USMC

Warren, MI



Distribute



Repair



Train



Leadership • Service • Innovation

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

- Military Police
- Smaller platforms
- Enhanced battery life
- Commonality
- Remote deploy
- More capable payloads

2011-Future

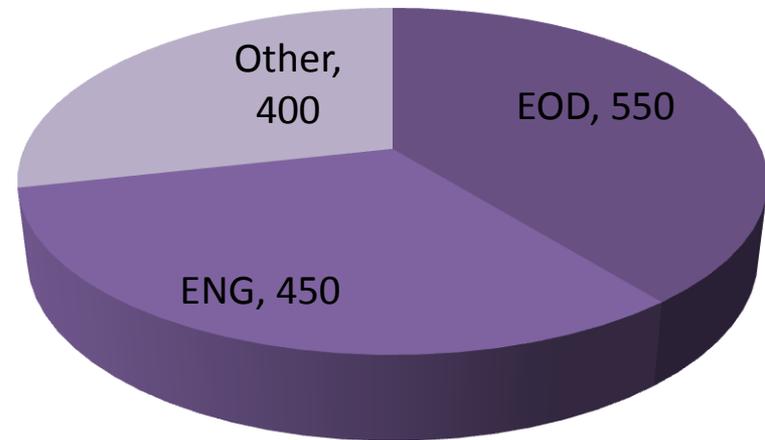
- Interoperability
- 'Plug & play' capabilities
- Limited autonomy
- Weaponization
- Increased agility and dexterity

Almost one third of robots issued to units in 2009-2010 went to units other than EOD and Combat Engineers.

Not just for EOD anymore...

- As new platforms emerge for our traditional users (EOD and Engineers) older systems are offered to non-traditional robot users
- This gives these non-traditional users additional tools to apply to their own situation and locale (allowing them to “change the game”)
- No complicated and time consuming approval process

Almost one third of over 1,400 robots issued to units in Afghanistan are now issued to other than EOD and engineer units



MI 60 Anti-personnel Mine Clearing System



Gripper - optional



Rollers - standard



Handheld OCU - standard



Blade - optional



Flail - standard

- Handheld Operator Control Unit (OCU) to control steering, cameras and attachments
- Has 4 different attachment the rollers, flail, gripper, and blade
- Suitable for mine clearing in urban areas, fields, forests, bushes, unimproved roads, riverbanks and muddy areas
- Engine and vital components are protected by steel and armor plates

Play
video



XMI216 Small Unmanned Ground Vehicle



ROBOTIC SYSTEMS JPO

GPCS (HMS, GPS, Antenna)

- HMS SFF-D-based UHF radio
- Head-height dual band (UHF/GPS) mast antenna

Chassis

- Fits in a Single MOLLE Pack
- Meets Mobility Requirements
 - Slopes
 - Steps
 - Subterranean
 - Water
- CPU Upgrade/AWARE 2
- Flippers
 - 360° Rotation
 - Obstacle navigation
 - Stair Climbing
 - Self-Righting
- Tool-less Removal

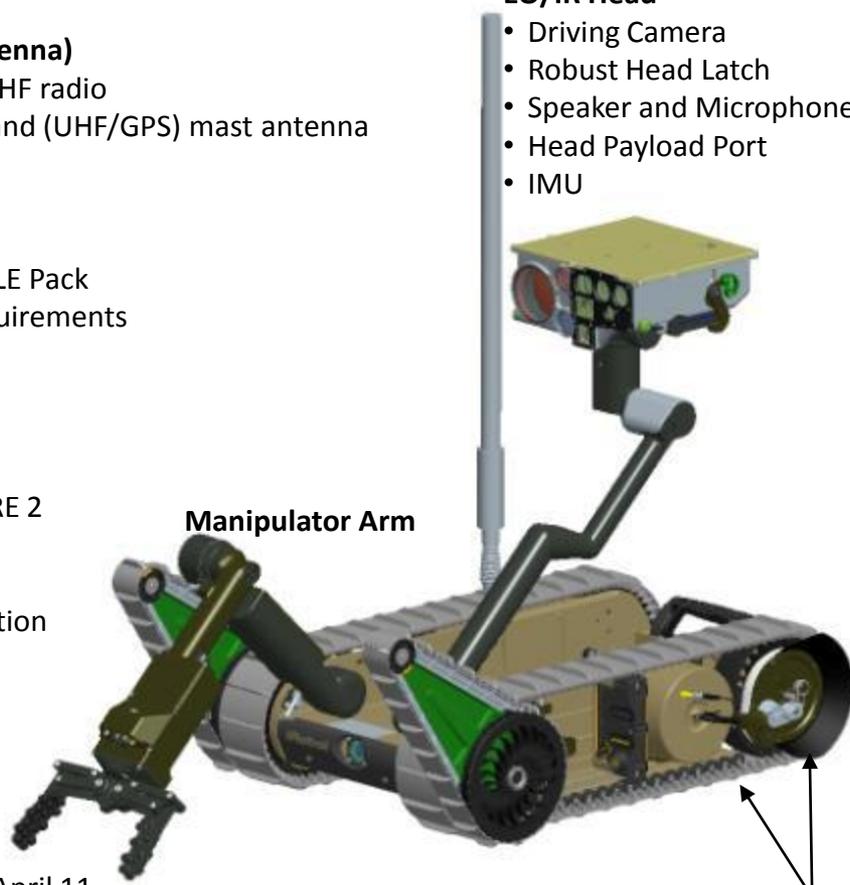
Increment One SUGV

- Fielded to 1st BDE: April 11
- Fielding to 2/3 BDEs: 2012
- RAM/MTBSA: over 84 hours vs. req of 42 hours

EO/IR Head

- Driving Camera
- Robust Head Latch
- Speaker and Microphone
- Head Payload Port
- IMU

Manipulator Arm



BB-2590 Battery Packs

- Common Inventory Item
- Tool-less removal

Fiber Optic Tether/Spooler



Leadership • Service • Innovation

Way Ahead/Opportunities

- Interoperability and Commonality goals
 - Interoperability profiles – industry participation
 - Promotes modularity
 - Promotes competition
 - Reduces logistics burden
- Partnering between Defense and Industry
 - NDIA, AUVSI, RTC are all good examples
- Pending Contract Action
 - RSJPO SETA Support Contract RFP expected soon



UGV Emerging Requirements

- Autonomous Mobility Appliqué System (AMAS)
 - » Add-on appliqué system to virtually any manned vehicle
- Squad Multi-Purpose Equipment Transport (S-MET)
 - » Small, self-transportable utility/cargo platform
- Engineering Squad Robot (ESR)
 - » USMC Man-portable, lightweight robot
- Ultralight (Throwable) Robots –
 - » Multiple agencies (JIEDDO, USMC, REF)
- Tactical Robot Controller (TRC)
 - » USMC-led effort

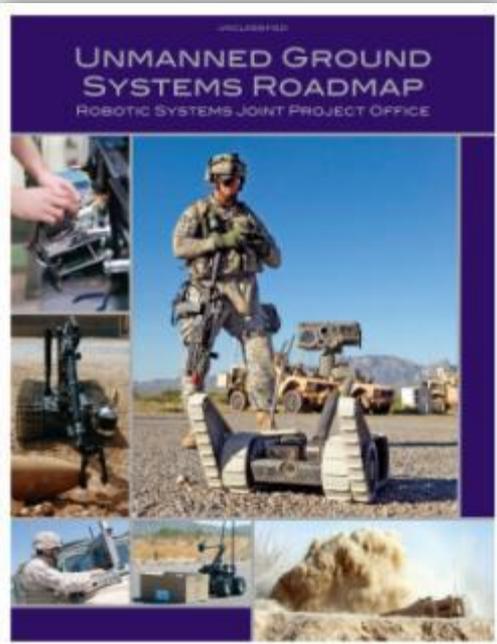


Unmanned Ground Systems Roadmap July 2011



ROBOTIC SYSTEMS JPO

- RSJPO Organization
- Technology Needs/Enablers
- Modernization Strategy
- Systems/Programs Portfolio
- Technology Needs



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Autonomous Navigation	Adjustable Waypoints Way Point Navigation	Layover Planning Apply of Advisory E-Is	Incremental Advancements in Navigation and Sensor Fusion (throughout)			Object Detection & Tracking Intelligent Reactive Architecture	Total Coverage Operations in High Latency/ Low Bandwidth Environment		Autonomous Operations	
Communications	IP Addressable Radio Software Defined Radio	MESH Networking/ Repeaters	Multi-Cast			Encryption Standards	Cognitive Radio		Global Mesh Networking	
Power	Improved Performance Hybrid Energy Storage	Lithium Technologies 100W Fuel Cell Packaged Fuel	Fuel Cell Off Board Processed Fuel Cells High Power Grid Engines			Advanced Fuel Cell Tech JF-4 Refinement on Platform		Incremental Advancements in Power Management & Energy Harvesting (throughout)		
Vision	Improved Duration & Reduced Signature	Larger Duration Sensors	Increased Service Life Increased Energy Density			Incremental Advancements in Power and Energy Performance (throughout)		Intra-Service/Operational Identification		
Architecture	Open Architecture Accepted Specifications/Standards	Government Mandated Common Open Architecture			Industry Provides Open Common Architecture					
SMI	Mounted Touch Screen Displays Tactile Feedback	Deconvoluted Touch Screen Displays			Flexible Displays		Advancements in Interface Automation & Human Ergonomics			
Manipulators	OCU/Headset Controller w/ Proprietary GUI	OCU/Multiple Decentralized Robots in Geo Domain			One Operator/Multiple Decentralized Robot Control		Wearable Interfaces		One Operator/Multiple Autonomous Robot Control	
Terrain Mobility	Stability Control & Semi-Active Suspension	Terrain Recognition	Waterproof Swim/Jump Kit			Object Classification Algorithms		Active Passive Soil		Dynamic Terrain Classification
Payloads	Low Cost UOAR	Fuel Cell Generation	RAMAN Spectroscopy			Non Lethal, lethal Weapon Systems		Brain Computer Interfaces		Full Autonomy Packages

Leadership • Service • Innovation

Any Questions?



ROBOTIC SYSTEMS JPO

Leadership • Service • Innovation



2011 Advance Planning Brief for Industry

Ground Combat Support Readiness & Sustainment (GCS R&S)

Mr. Jerry Figueroa
Director, GCS R&S
TACOM LCMC ILSC

DISTRIBUTION STATEMENT : Approved for public release, distribution is unlimited.

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Product Support Integration Directorates:

Heavy Combat:

Alvin McGill

Abrams
M88's
AVLB
Wolverine
JAB
ABV
Track and Road Wheels

Field Artillery:

Sherrie Nunn-Berry

Self-Propelled Artillery:
Paladin
FAASV
Towed Artillery:
M119 Howitzer
M777 Howitzer
M198 Howitzer
Target Acquisition:
GLPS
IPADS/ PADS
M94 MVS
Robotics:
M160
SUGV

Light Combat:

Dave Horton

Bradley FOV
M113 FOV
Stryker
Knight FOV
DSESTS



Sustainment Health Index

SYSTEM

WORLDWIDE READINESS

M1 ABRAMS

GREEN

BFVS

GREEN

M109 PALADIN

GREEN

STRYKER

GREEN

M88 RECOVERY VEHICLE

GREEN

M113

GREEN

TEAM EFFORT WITH GREAT SUCCESS

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FY11 RESET

<u>PSID</u>	<u>VEHICLES</u>	<u>DOLLARS</u>
HEAVY COMBAT	244	\$ 207M
LIGHT COMBAT	533	\$ 417M
ARTILLERY	584	\$ 22M
TOTAL	1361	\$ 646M

INCLUDES DEPOT AND PARTNERSHIP PROGRAMS

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Spares Business Base

	FY11 Parts Sales \$	FY12 Spares Contract \$
M1 ABRAMS	\$323.6M	\$266.0M
BFVS	\$199.4M	\$ 61.1M
M88 RECOVERY VEH	\$ 85.6M	\$ 4.9M
M113 CARRIER	\$117.5M	\$ 12.4M
M109FOV/FAASV	\$ 17.1M	\$ 5.2M
M777A2 Howitzer	\$ 72.0M	\$ 44.7M
M119A2 Howitzer	\$ 12.8M	\$ 18.7M

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Top Ten Forecast Procurements for Heavy Combat:

NSN	NOUN	WPN SYS	\$VAL
2530-01-435-5175	Abrams Track Shoe Assembly	M1 FOV	\$34,894,977
2530-01-587-6141	Bradley Track Shoe Assembly	M3	\$33,440,192
2530-01-346-9233	M113 Track Shoe Assembly	M109A6	\$4,425,421
1240-01-390-4980	Commanders Periscope	M1A2	\$3,278,336
2530-01-234-1917	M9 ACE Track Shoe Assembly	M9 ACE	\$2,673,576
2530-00-692-9316	M88 Track Shoe Assembly	M88	\$2,189,578
5855-01-581-0863	Color Tactical Display	M1A2	\$1,735,536
2815-01-500-7584	M88A2 Diesel Engine Repair Kit	M88A2	\$1,509,971
5985-01-523-6218	Contol-Power Supply (PPC)	M1A2	\$1,188,618
6650-01-078-1180	Optical Mirror	M1 FOV	\$1,074,236
		<u>TOTAL</u>	<u>\$86,410,440</u>

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Top Ten Forecast Procurements for Light Combat:

NSN	NOUN	WPN SYS	\$ VAL
2540-01-396-2826	Heater	M113	\$2,421,436.00
6115-01-562-6264	Generator	MLRS	\$1,994,744.00
2540-01-475-4919	Heater Parts Kit	M113	\$1,731,585.00
5855-01-537-1406	Wired Housing Assembly	Bradley	\$1,316,260.00
2540-01-312-4730	Shock Absorber	Bradley/MLRS	\$1,194,038.00
7025-01-530-3262	Display Unit	Armored Knight	\$1,021,193.00
2540-01-529-0585	Vehicle Modification Kit	M113	\$904,911.00
4320-01-376-5651	Axial Piston Pump Unit	DSESTS	\$562,588.00
6605-01-422-3464	Magnetic Compass	Bradley	\$513,000.00
6105-01-521-7889	Torque Motor	Bradley	\$497,122.00
		TOTAL	<u>\$12,156,877.00</u>

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Top Ten Forecast Procurements for Field Artillery:

NSN	NOUN	WPN SYS	\$VAL
1015-01-362-5288	Recuperator Cylinder	M119 How	\$8,751,447
1240-01-483-6103	Panoramic Telescope	M119 How	\$5,761,079
1015-01-546-0565	Buffer, Recoil Mechanism	M119 How	\$5,138,400
1240-01-483-5324	Telescope Mount	M119 How	\$1,626,430
1015-01-544-4871	Elevating Support A	M119 How	\$1,560,765
1015-01-540-1245	Howitzer Mount	M119 How	\$1,119,600
1025-01-569-3629	Obturator Ring	M777 How	\$993,600
1015-01-484-2881	Elevating Mechanism	M119 How	\$797,400
2910-00-937-9539	Fuel Tank	M109 How	\$751,606
4910-01-592-8070	Oil Transfer System	M109 How	\$690,200
		<u>TOTAL</u>	<u>\$27,190,527</u>

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Partnerships

Partnerships in Place or Planned:

Abrams

GDLS, Honeywell, Allison, & ANAD

BFVS

GDLS, BAE, L3COM, & RRAD

Stryker

GDLS & ANAD

M109 Paladin/FAASV

BAE & ANAD

Knight FOV

DRS-SSI

DSESTS

DRS Test and Energy Management

Committed to ~~EXCELLENCE~~ ~~OPPORTUNITIES~~ ~~EXPANDING~~ America's Warfighters



Final Thought

Industry partnerships are critical in our ability to fully support our Soldiers and Mission.

We thank you for your continued support, and for the world class products you provide! Your efforts enable us to outfit our soldiers with the best ground combat equipment in the world.

Questions or Comments?

Committed to Excellence — Supporting America's Warfighters