Robotic Systems
Joint Project Office

Ground Robots in War

Presented to

Expeditionary Warfare Conference

26 October 2006

A “Sleeping Giant” Awakened

The World Changed

- **WWII History Showed…**
  - **…That a "Sleeping Giant" Awakened**
  - **… Unprecedented Technology Development**
- **9-11 Changed…**
  - **…Not Just the Way War Waged Against Us…**
  - **…But, Once Again, the Way that We Respond**
- **OIF/OEF History will Show…**
  - **… Surge in Technology Development/Application**
  - **… Advent of Ground Robots in Combat**

Evolution of Ground Robotics in War

2004 162 Systems

- No Single Vendor Could Produce 162
- 5 Vendors, Multiple Configurations
- Joint Effort, EOD Focused
- Joint Robotic Repair Facility Evolution

2005 1800 Systems

- Robots' Proven Ability to Save Lives
- Expansion Beyond EOD Mission
- Recognition of Need for "Single Bellybutton"
- MOAs with AMC and REF

2006 4000 Systems

- Continued Proliferation
- Engineers, Infantry, and Special Forces
- Route Clearance, Countermine, Weaponization.
- Pre-Deployment Training and Embedded Repair Teams (ERTs)
- Supply Chain Management of COTS

The Cost in Lives

WAR	US Deaths per Day
World War I	200
World War II	219
Korea	32
Vietnam	19
Iraq	2

Thousands of Ground Robotic Missions Have Saved Lives…

GROUND ROBOTS WILL SAVE MORE!

A Service Member….
or a Robot

Ground Robots in Action

- **Over 150 Missions a Day**
- **More Than a Thousand Systems Destroyed**

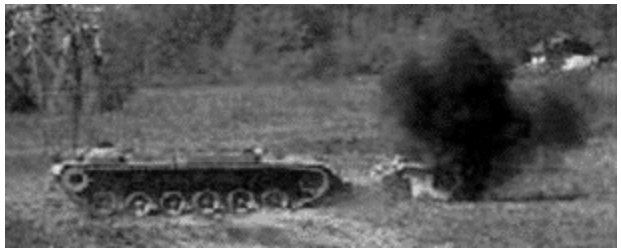
Ground Robots in Action

"Robotics 101"

- **Definition**
  - **Webster's (Robot): A Machine or Device That Works Automatically or by Remote Control**
  - **Military Application: Remote Combat Tasks to Accomplish the Mission and Save Friendly Lives**
- **Components**
  - **More than Vehicles**
  - **System (Chassis, Control Unit, Payload)**
  - **Software Intensive**
- **Levels of operation**
  - **Tether**
  - **Tele-op**
  - **Semi-Autonomous**
  - **Autonomous**

Toolbox Concept

Legacy Systems



Panther

Mini Flail

MATILDA

- **Panther**
  - Anti-Tank
  - Abrams with Roller
  - From Bosnia / Kosovo
  - To Iraq
- **Mini Flail**
  - Anti Personnel
  - Bosnia / Kosovo
  - Afghanistan
  - Retired
- **MATILDA**
  - Ft. Leonard Wood
  - Deployed OIF / OEF
  - Retired

Current Systems

PROGRAMS OF RECORD

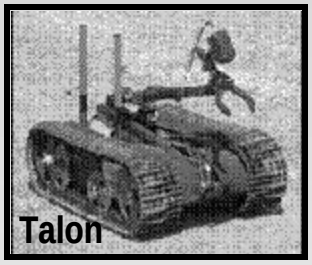

Gladiator

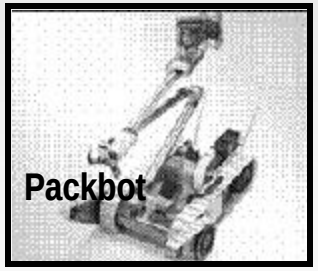

MV-4


Assault Breacher Vehicle

IED SYSTEMS


Bombot


Talon


Packbot

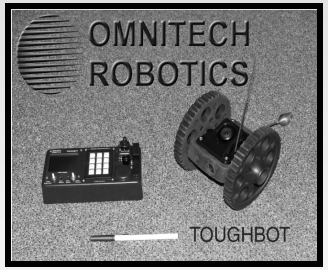

Marcbot

Global JRRFs/ERTs

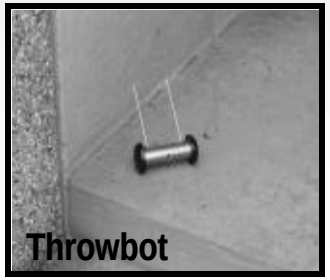
MULTIPLE S&T EFFORTS


Chaos


Eye Ball




Dragon Runner


Throwbot


ODIS

ABV- Remote Control System

Assault Breacher Vehicle (ABV)

MV 4

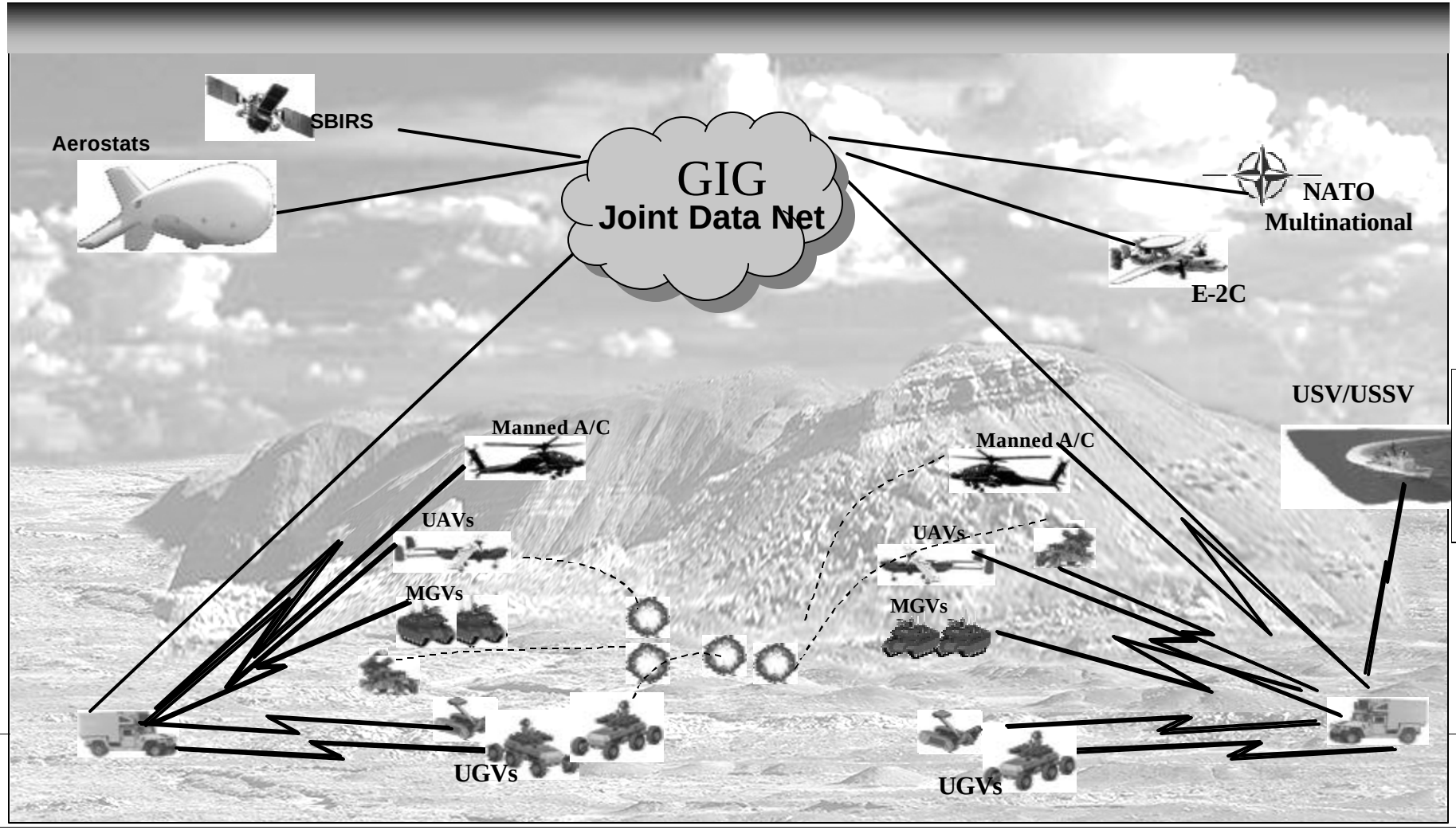
DOK-ING MV4

Gladiator

Gladiator

The Future? COLLABORATION

- Interoperability
- System of Systems
- Joint Shared Integrated Picture
- Sensors, Shooters, Command, Control & Communications
- Reconnaissance/Surveillance



FCS Ground Robotic Systems

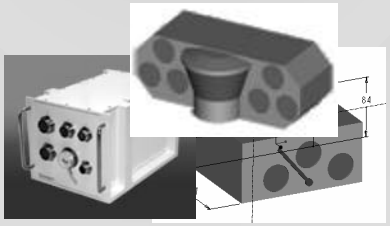
Armed Robotic Vehicles-Assault-Light (ARV-A-L)

Multifunctional Utility/Logistics and Equipment MULE-Transport

Small Unmanned Ground Vehicle (SUGV)

Countermine-Mule

Armed Robotic Vehicles ARV-RSTA



Autonomous Navigation System ANS

Armed Robotic Vehicles ARV-Assault

Ground Robotic Master Plan

- **GRMP Links Unmanned Systems S&T to Capability**
  - **Army-Marine Corps Activity (Not OSD "JRP Master Plan")**
  - **Systems Engineering Rather Than Ad Hoc Approach to Master Plan**
  - **Partnered with PM UAS and Defense Acquisition University**
  - **OSD JGRE (Previously Called JRP) to Have Similar Initiative 2007**

- **Technology Assessment & Transition Management (TATM)**
  - **Uses Capability Assessments / Gap Analyses**
  - **2 Key Components: Database/Tool Kit and a Process**
  - **Use of Data (e.g., Technology Maturity & Criticality)**
  - **OIPT/WIPT Process to Make Decisions/Recommendations**
  - **4 Overarching Stakeholders User / S&T / PM / Sustainer**
  - **Results in a Published Plan and Signed TTAs**

- **Stages**
  - **Version 1.0 July 2005 Army-Marine "Catalog," Not a "Plan" (Data Only)**
  - **Version 2.0 September 2006 Army-Marine Closer to "Plan" (Used Data & Process)**
  - **Version 3.0 June 2007 to Become First "Plan" (Tied to POM Process, Signed TTAs)**

Help Needed

- **Think JAUS (Joint Ground Interoperability Standard)**
- **Common OCU (Driven by Requirements)**
- **Improved Network Interoperability**
- **MANPRINT Standardization**
- **Logistical Efficiencies**
- **Budgetary Challenges**

Now More Than Ever…

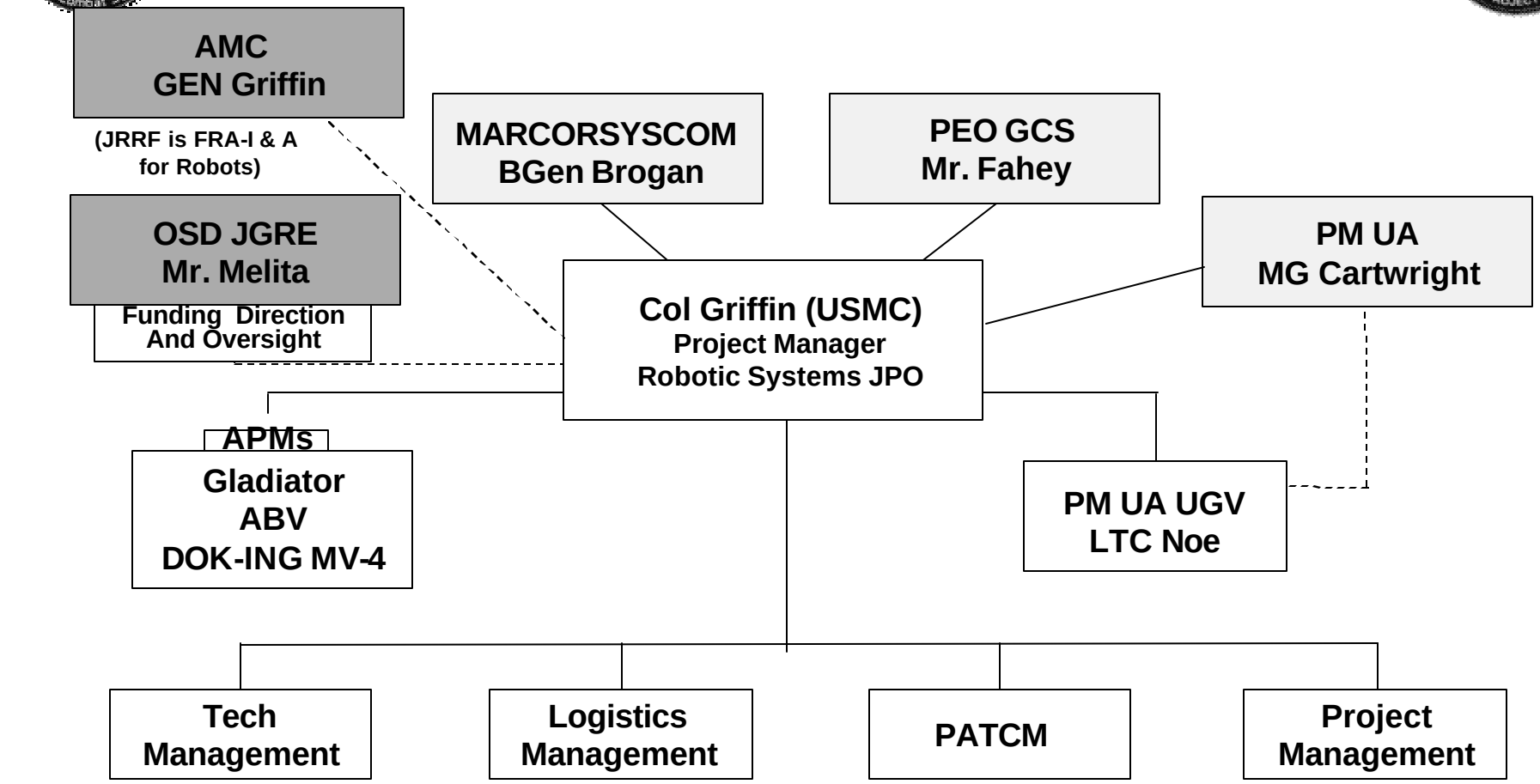
…Because the World Changed

We Must Never Sleep Again

Robots Don’t Sleep

BACK-UPS

Robotic Systems Joint Project Office



Army – Marine MOA

Over 20 Robotic Systems

Chartered by AAE

Rapid Fielding "1-2-3 Process"

- **"1" Tech Insertion Experiment (Funding Varies)**
  - **"1-a" CONUS Assessment Before OCONUS**
  - **"1-b" Theater 90 Days if "1-a" is Faborable**
  - **Pre-Deployment Sustainment and Assessment Plan**
- **"2" ONS/UNS (GWOT, JIEDO, REF Funding)**
  - **If OCONUS "1-b" Assessment is Favorable**
  - **More Robust Sustainment and Assessment Plan**
  - **Process Link to Formal Requirements Domain**
- **"3" Enter Formal Acquisition Process**
  - **Feeder Requirement or New Requirement**
  - **More Rapid Acquisition (Enter at MS B or MS C)**

Challenges & Opportunities for Industry

- Autonomous Mobility
- Autonomous Mobility Performance
- Perception Safety (Moving Persons and Vehicles)
- Navigation Challenges (Adverse Weather, Negative Obstacles)
- System Control Devices
- Autonomous Operations
- Development of Tactical Logic/Command Control
- Non-Line-of-Sight Communications
- Non-Active (Stereo) Perception
- Reliability/Availability
- Anti-Tamper Capability
- Lightweight, Rugged Components
- Improved Battery Technology