Agenda

• Theatre Challenges Today

• Our Challenge –
  – Balancing Performance, Protection, Payload

• The Evolving Threat – An Enemy that Adapts & Learns
  – Survivability
  – Condition Based Maintenance
  – Power & Energy

• Preparing for the Next Conflict
Theatre Challenges Today

- Extreme environmental temperatures lead to excessive engine temperature & fuel consumption
- Excessive weight from Add-on-Armor
- Excessive amounts of sand interfere with system operations
- Excessive speeds over rough terrain
- Lack of scheduled maintenance or incomplete maintenance
- Vehicles absorbing large amounts of ballistic damage
- Excessive vehicle idling based on mission profiles / needs
- Increased vehicle power requirements due to survivability initiatives
- Mission creep on vehicles (e.g., RHINO, Mine roller kits, MRAP MEAP, CROWS, FRAG 5, Reactive Armor Tiles)
- Extended supply distribution system
Our Challenge – Balance Performance, Protection, Payload

1. Original TWV Design
2. DESIRED TWV Future
3. Buying Protection
4. Buying Performance/Payload
5. Buying All with Current Tech
6. Maintaining the Iron Triangle

Payload

Pre 2000

Post 2000

Current HMMWV

Trades

Performance

Protection

Performance

Protection

Performance

Protection

Payload

Payload

Payload

Heavier Vehicle

JLTV

S&T needs to define/achieve “Obtanium” for light-weight armor that is affordable or an integrated approach.

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.
Our Challenge

Current Systems

M1114  RG31  MRAP

Future Systems

JLTV

Desired TWV Future

Performance

Protection

Payload

Post 2000

What is the next-generation vehicle that allows the same protection but also payload & performance?
Asymmetrical Tactics

Urban/Guerilla Warfare
- Hide in plain sight
- Use of hostages

Insurgent Weaponry
- Improvised explosive devices
- Rocket-propelled grenades
- Blasting caps
- Small arms
- Anti-tank weapons
- Biological and chemical weapons
- Chlorine
- Precision weapons
- Automatic and self-loading rifles
- Explosively formed projectile

“...Insurgents are always ‘seeking to achieve higher levels of effectiveness’ and these new tactics are part of the normal ‘evolution of sophistication.’”

-- Associated Press
How Do We Keep Ahead

Current Process

• Threat Rapidly Adapting to Our Technologies
• Use a “Systems Approach” Design
• Investigate New Materials or Develop New TTPs
• Quickly Adapt to Changes in Threat & Leverage Advances and Technology Changes

A Game of Cat and Mouse
Current Systems

- Full spectrum active protection systems countering both close and long range threats
- Lightweight, multifunctional armor for manned and unmanned ground platforms (Combat and Tactical)
- Improved and enhanced damage mitigation technologies (fire suppression, design for survivability, laser)
- Modular 360 degree day/night vision systems for situational awareness – application of MEMS imagers
- MEMS and Nanosystems for vehicle based sensing of chemicals, explosives and biological agents
- Hand-held transducers for armor health determination
- Functional MRI for diagnosis and of treatment guidance of blast induced traumatic brain injury coupled to vehicle mounted accelerometers

Supporting Science and Technology Investments

Future Systems
Today’s Health Management

Future Desired Endstate

- Prognostics – Predictive Maintenance
- Condition Based Maintenance – Fact Based, Trend Analysis
- Vehicle Health Management System – Embedded Diagnostics, Self Reporting, Self Monitoring
- Platform Information – Electronic Technical Manuals, Built in Test / Fault Isolation Test, Vehicle Diagnostic Management System
- Digital Platforms – Digital Architecture / Data Collectors
**Power & Energy**

### Current Systems

**M1114**
- 400A Alternator (M1114 Kit)

**RG-31**
- 280A Alternator (RG-31 Kit)

**M939**
- 3.5kW Auxiliary Power Unit to support Asymmetric Threat Defeat JUONS

### Future Systems

**Power & Energy**

**Diesel Engine Research**

**MTU 4L 890 Engine**

**Battery Improvement**

**Pulse Power Supply for High Energy Lasers**

### Efforts Supporting Current Force

- AGT-1500 Engine Durability
- LMTV Full Load Cooling Challenges
- TWV engines and emissions challenges
- Demand on Systems
- On Board Power Kits for M1114 and RG-31
- APU Upgrades for M-939 and RG-31
- Non-primary Power for PEO GCS Combat Vehicles testing and development
- Non-primary power load profiles

### Efforts Supporting Future Force

- High operating temperature power electronics (SiC)
- Compact integrated hybrid power systems for future combat and wheeled vehicles
- Battery Improvements

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**TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.**

Unclassified 10
TRENDS IN OUR BUSINESS

• Moving from serial, phased milestones to addressing full lifecycle, parallel events

• Moving from the age of creating information to the age of leveraging information, data, and expertise ----GLOBALIZATION

• Moving from physical to virtual & collaborative product commerce

• Moving from drawing & document creation to information reuse and management

• Moving from self-solving to collaborative problem solving
Preparing for the Next Conflict

• Better Partnerships to achieve rapid technology evaluation

• What toolsets/expertise can or should we adapt for our use?

• Requires system engineering & analysis to understand the trade space

• Traditional and Non-Traditional Partners

• Rely on Teamwork

• Risk Taking versus Risk Adverse

• Leverage, leverage, leverage
So how do we get there?
YOU, ME and US
### COMBAT SYSTEM

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<tr>
<th>SYSTEM</th>
<th>PEACETIME ANNUAL OPTEMPO</th>
<th>WARTIME Only ANNUAL OPTEMPO</th>
<th>ANNUAL OIF (Operation Iraqi Freedom) OPTEMPO</th>
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### TACTICAL VEHICLES

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<th>SYSTEM</th>
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<th>WARTIME Only ANNUAL OPTEMPO</th>
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**Source of Data - Army OSMIS and AMSAA SDC Reports on Part Replacement in OIF.**

Peacetime Data reflects 2002 timeframe and Wartime Data reflects 2005 timeframe. SDC Data is based on data being collected in theater from 2004 to August 2006 timeframe.