



ITC-Germany Visit



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Chuck Coutteau, Associate Director
Ground Vehicle Power and Mobility Overview
10 November 2011

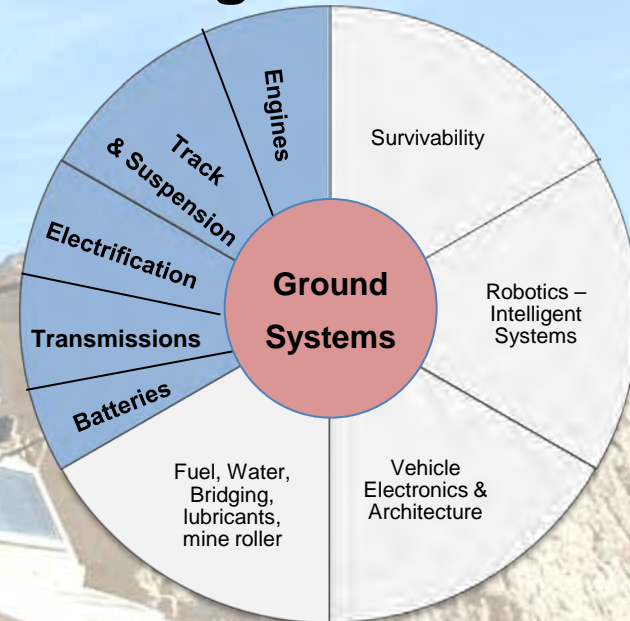
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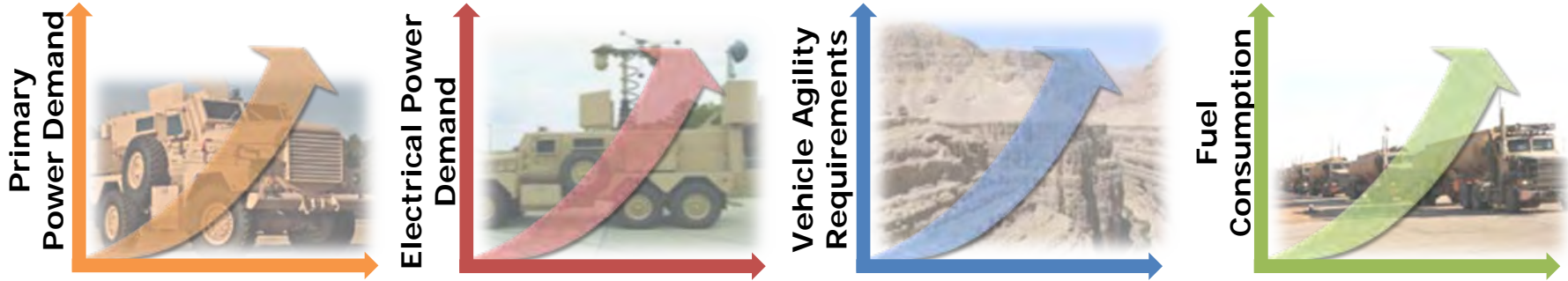
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Vision: GVPM will be the DoD's first choice for ground systems power and mobility solutions



Mission: Research, develop and deliver ground systems power and mobility technology solutions to the current and future force



Increasing demands, operational flexibility, and inter-relationships
Requires a Systems Engineering approach and investments in key technology areas



Propulsion & Thermal Management



Non-Prime Power Systems



Advanced Propulsion



Track & Suspension

Systems Level Analysis, Integration and Testing

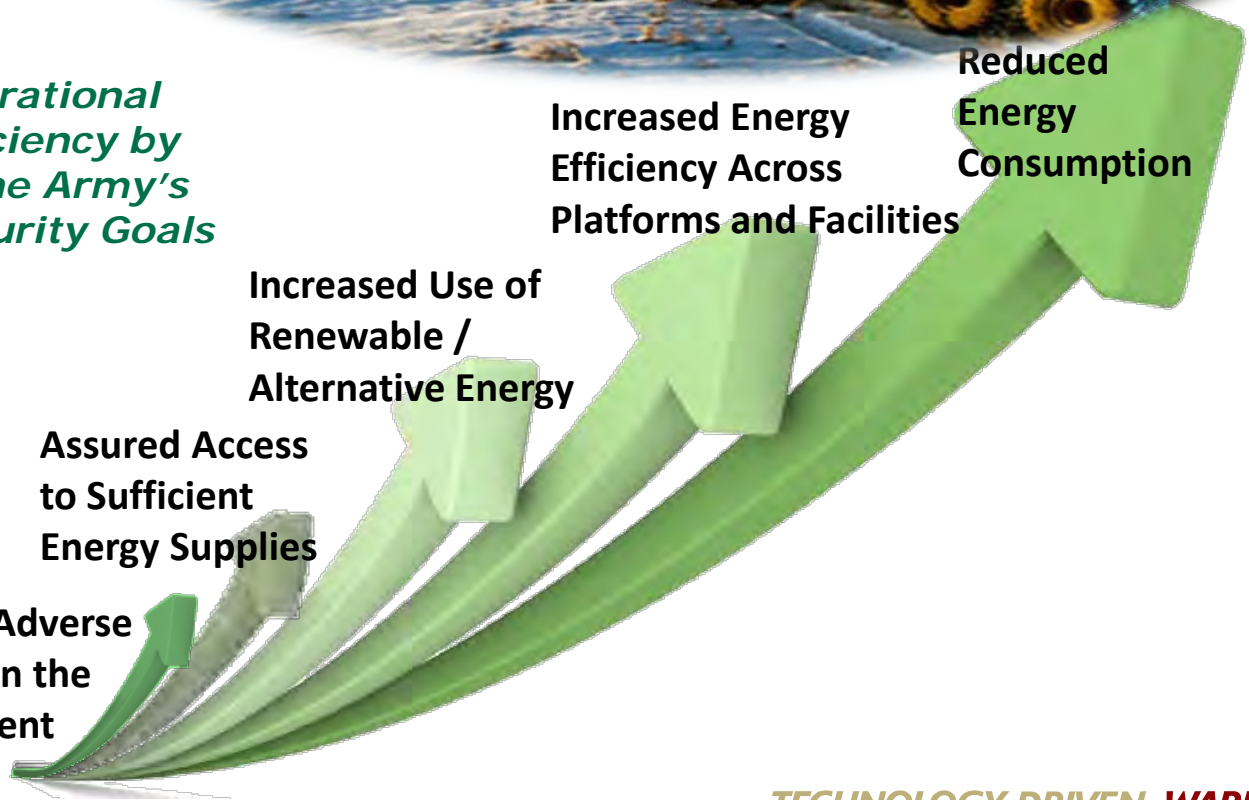


Operational Energy:

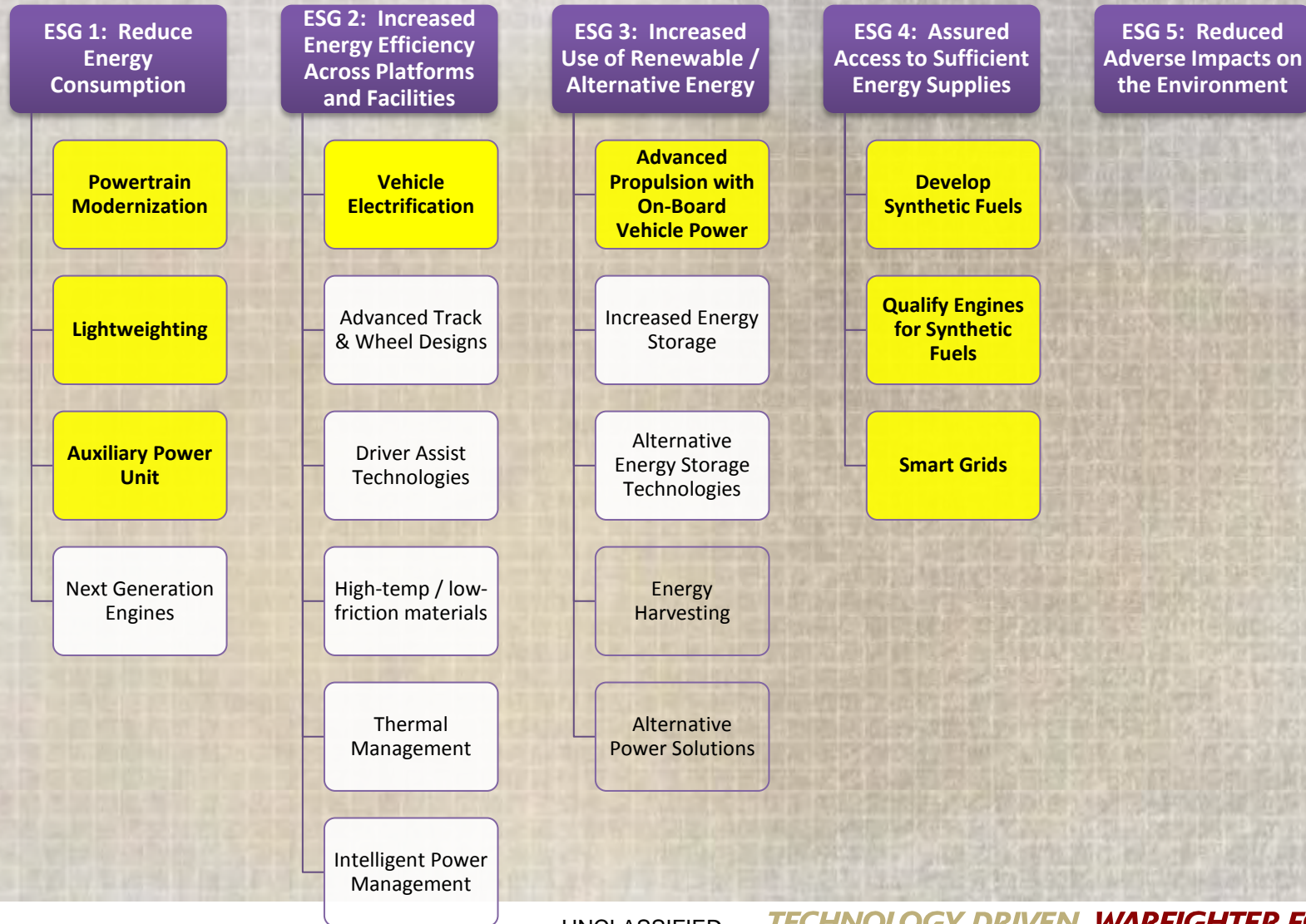
“energy required for training, moving, and sustaining military forces and weapons platforms for military operations.”

2010 QDR

Pursue Operational Energy Efficiency by targeting the Army's Energy Security Goals



Reduced Adverse Impacts on the Environment



Why we need it...

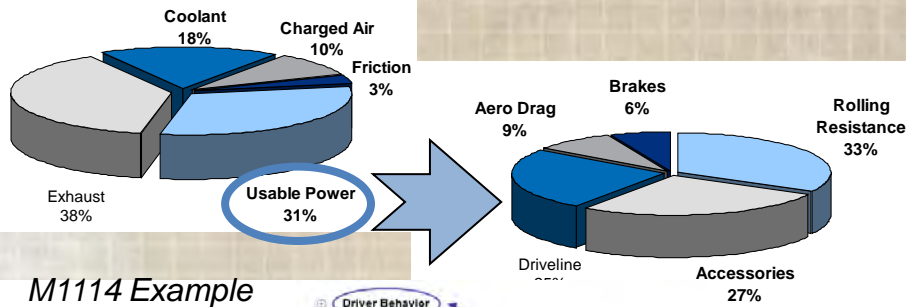
- 70-80% of convoys deliver fuel and water in a typical theater
- Fully burdened cost of fuel (FBCF) as high as \$50 /gal in Afghanistan
- 18% of US casualties in OIF and OEF are related to ground resupply

What needs to be done...

- Build Operational Energy into Army requirements and funding processes

What's required to enable...

Characterize Engine and Vehicle Energy Usage



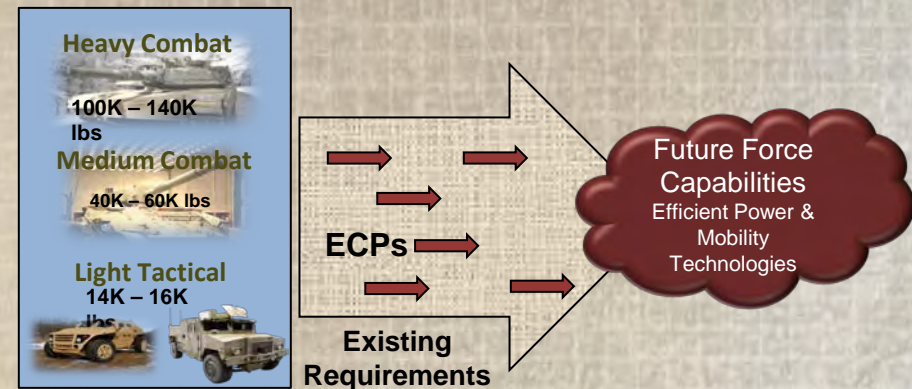
M1114 Example



Establish Vehicle Energy Baselines

- Duty cycles
- Basis of improvement strategy

Incorporate Operational Energy into Fleet Modernization Requirements



- Update Vehicle Requirements to drive improvements
 - Operational priorities
 - ECPs based on old requirements

Ground Vehicle Power and Energy Technology

Propulsion and Thermal Management

Diesel Engines

Turbine Engines

Transmissions

Advanced Radiators

Advanced Electronics Cooling

Heat Recovery

Thermal Architectures

Non-Prime Power Systems

JP-8 Fuel Cell APU

Rotary Engine APU

Advanced Lithium Ion Batteries

Advanced Lead Acid Batteries

Capacitors

Li-Ion / Ultracap Hybrid Energy Storage

Advanced Propulsion

Integrated Starter Generator

Advanced Propulsion Systems

Traction Motor Testing

Advanced Propulsion Reliability Testing

High Temperature / Power SiC Power Electronics

Wide Band Gap Materials (SiC)

Track and Suspension

Track Systems

Suspension Systems

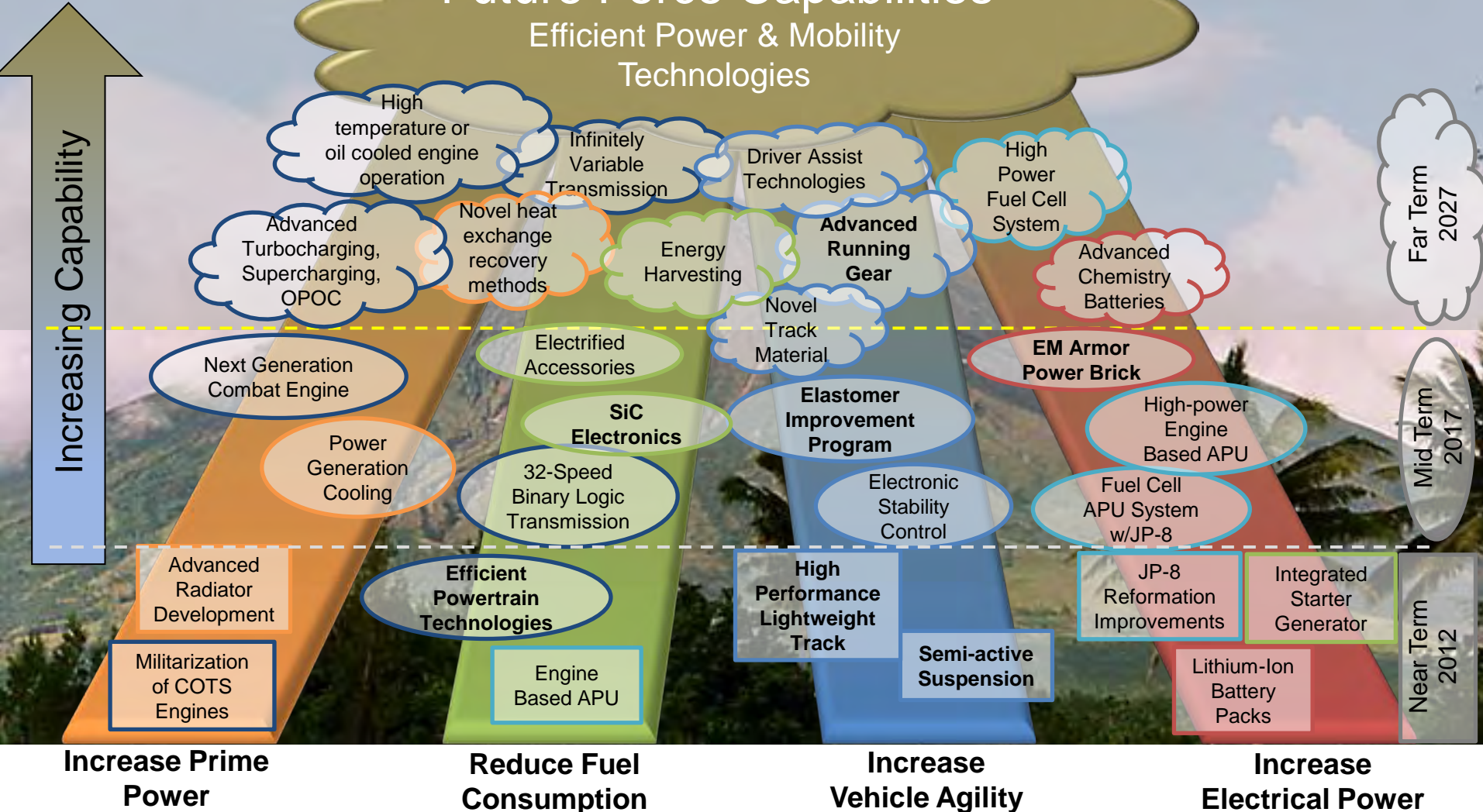
Electronic Stability Control

UNCLASSIFIED

Track Elastomer Research

Future Force Capabilities

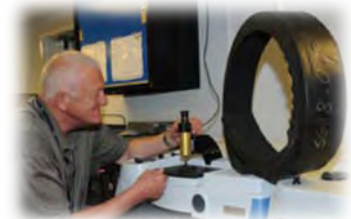
Efficient Power & Mobility Technologies



- **Propulsion Laboratory**
 - **Engine Dynamometer Test Cells**
 - **Power and Inertia Simulator (PAISI) Test Cell**
 - **Vehicle/transmission/drive axle Evaluation Test Cell**
 - **Single-cylinder Engine Research Test Cell**
 - **Engine Generator Test Lab**
- **Full Vehicle Environmental Test Cell**
- **Hybrid Electric Reconfigurable Moveable Integration Testbed (HERMIT)**
- **Electro-chemical Analysis and Research Lab (EARL)**
- **Battery Lab**
- **Air Flow/Cooling Lab**
- **Elastomer Lab**
- **Ground Systems Power & Energy Labs (GSPEL)**



Propulsion Lab



Elastomer Lab



Airflow/Cooling Lab



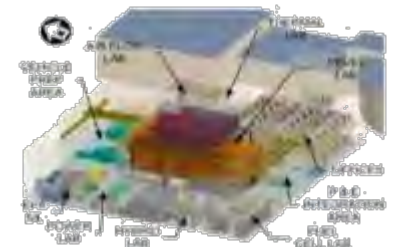
Battery Lab



HERMIT



Environmental Test Cell



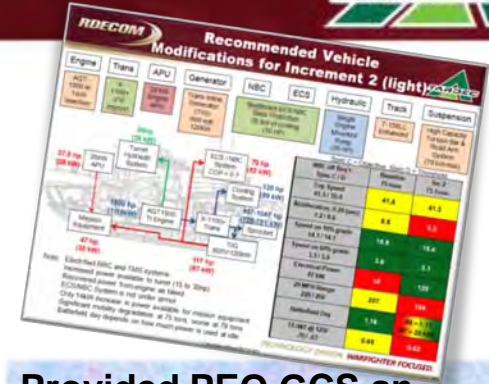
GSPEL



Developed methodology and tool for assessing Heavy Vehicle Road Damage



Improved Stryker Air Conditioning



Provided PEO GCS an independent analysis of upgrade options for Abrams



Tested and redesigned cooling system for MRAP-ATV with Sparks II Mine Roller



Conducted PIM Full Load Cooling Tests



Evaluated & qualified 5 engines for Alternative Fuels

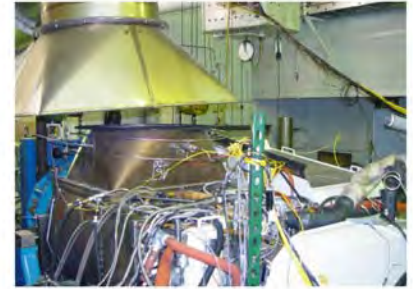


Tested and optimized MRAP Air Conditioning Design

Developed Abrams APU Engine



Bench tested Silicon Carbide (SiC) 150 kW DC-DC Battery-to-Bus (BTB) Converter



Completed independent durability assessment of OEM improvements to AGT-1500 Turbine engine to support PM decision making

Conducted competitive runoff evaluations on Bridging Boat engine candidates



Developed a proof of concept 10 kW fuel reformer/fuel cell auxiliary power unit operating on JP8 fuel



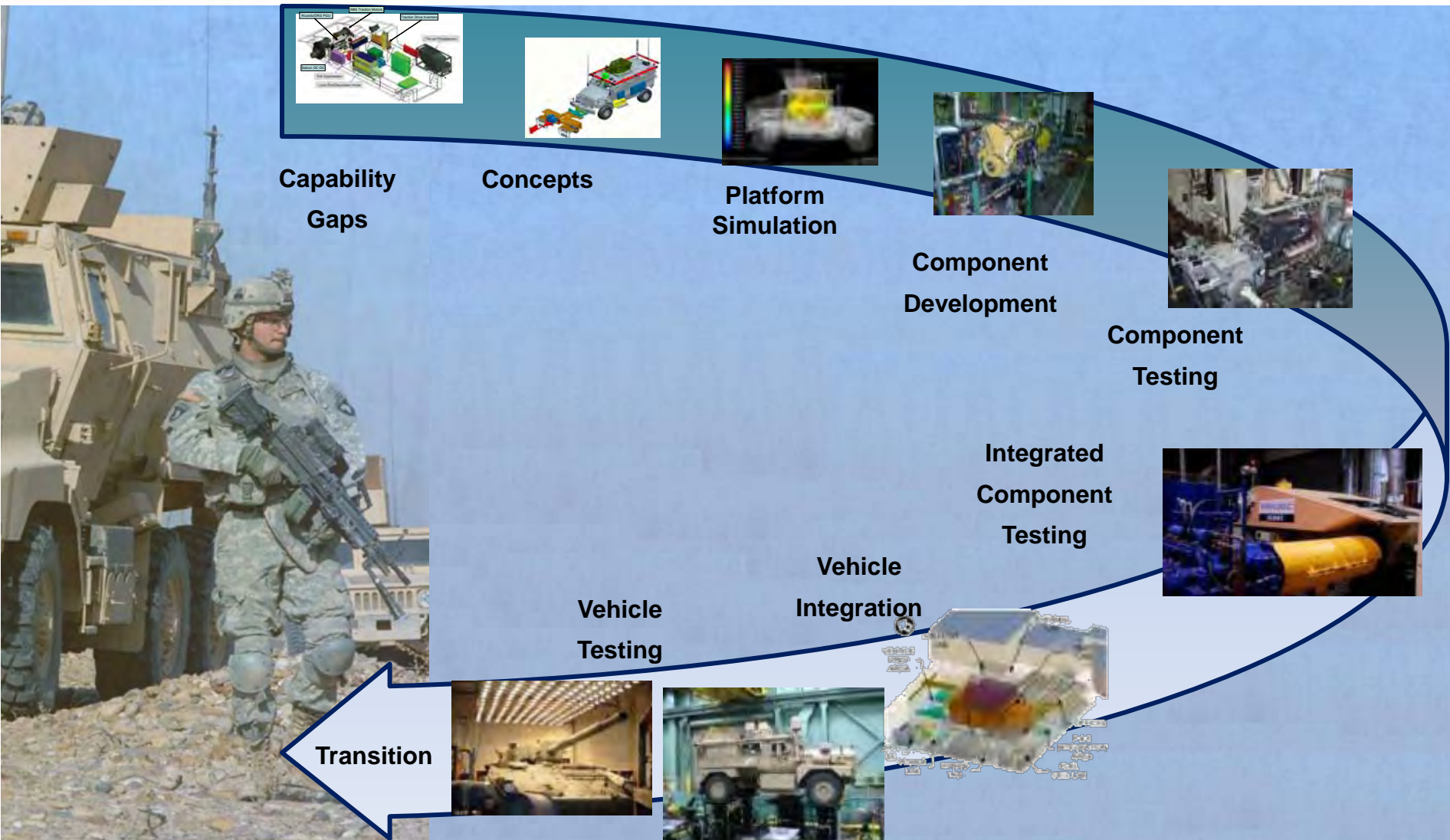
Commissioned a new four-quadrant dynamometer for characterization and testing of electric machines, e.g. hybrid electric propulsion motors



It's all about...Supporting the Warfighter



Backup Slides



Enabling Warfighter Capability Through Technology Development & Integration