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5 Years In the War...
A Perspective of Where We've Been and Where We Are Going

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Director, Tank Automotive Research, Development & Engineering Center

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TARDEC’s Business Portfolio

- Combat and Tactical Vehicles
- Logistics Equipment
- Water Generation and Purification
- Fuels and Lubricants
- Military Bridging
- Fuel and Water Storage, Distribution and Quality Surveillance Equipment
- Countermine Equipment

TARDEC is responsible for research, development and engineering support to more than 2800 Army systems and many of the Army’s and DoD’s top joint warfighter development programs.
1. REPORT DATE  
**09 APR 2007**

2. REPORT TYPE  
**N/A**

3. DATES COVERED  
**-**

4. TITLE AND SUBTITLE  
**5 Years In the War...A Perspective of Where We’ve Been and Where We Are Going**

5a. CONTRACT NUMBER  
**-**

5b. GRANT NUMBER  
**-**

5c. PROGRAM ELEMENT NUMBER  
**-**

5d. PROJECT NUMBER  
**-**

5e. TASK NUMBER  
**-**

5f. WORK UNIT NUMBER  
**-**

6. AUTHOR(S)  
**Bochenek, Grace M, Ph.D.**

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)  
**RDECOM TARDEC 6501 E 11 Mile Road Warren, MI 48397-5000**

8. PERFORMING ORGANIZATION REPORT NUMBER  
**17042**

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)  

10. SPONSOR/MONITOR’S ACRONYM(S)  
**TARDEC**

11. SPONSOR/MONITOR’S REPORT NUMBER(S)  
**17042**

12. DISTRIBUTION/AVAILABILITY STATEMENT  
**Approved for public release, distribution unlimited**

13. SUPPLEMENTARY NOTES  
**The original document contains color images.**

14. ABSTRACT  

15. SUBJECT TERMS  

16. SECURITY CLASSIFICATION OF:  
<table>
<thead>
<tr>
<th>a. REPORT</th>
<th>b. ABSTRACT</th>
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<td><strong>unclassified</strong></td>
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17. LIMITATION OF ABSTRACT  
**UU**

18. NUMBER OF PAGES  
**8**

19a. NAME OF RESPONSIBLE PERSON  

Standard Form 298 (Rev. 8-98)  
Prescribed by ANSI Std Z39-18
INSIGHT INTO ARMY GROUND VEHICLE BUSINESS

TACOM LCMC
(2007)*

US AUTOMOTIVE INDUSTRY
(2007 Dollars based on 2004 figures at a rate of inflation of 3.25%)**

Other US INDUSTRY
(2007 Dollars based on 2004 figures at a rate of inflation of 3.25%)**

*Source Data: TACOM Business Management Office

**Based on 2004 Annual Reports


TARDEC Technologies a Part of Army Transformation

Transforming technology for the future while serving the forces in contact.

Fully Networked Battle Command capabilities bridge the Current to Future Force and enable interdependent network-centric warfare

Accelerated Development and Fielding of DCT-MPF Solution

Characteristics of Army Transformation: Responsiveness, Deployability, Agility, Versatility, Credibility, Survivability, and Sustainability fully support Future Joint Force Attributes

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 and virtual prototypes to collaborative product commerce

Moving from drawing and document creation to information reuse and management

TRENDS ON THE SYSTEMS – ESTIMATED MILES PER YEAR

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>PEACETIME ANNUAL OPTEMPO</th>
<th>ANNUAL OIF (Operation Iraqi Freedom) OPTEMPO</th>
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</thead>
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<tr>
<td>M1126 STRYKER ICV</td>
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<tr>
<td>M1A2 ABRAMS</td>
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<td>M3A3 BRADLEY</td>
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<td>M113A3 APC</td>
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COMBAT SYSTEM

TACTICAL VEHICLES

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<tr>
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<th>PEACETIME ANNUAL OPTEMPO</th>
<th>ANNUAL OIF (Operation Iraqi Freedom) OPTEMPO</th>
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<td>M1114 - Up Armored HMMWV</td>
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<tr>
<td>M1075 PLS</td>
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Source of Data - Army Theater Part Usage Reports and Cost Database.

Peacetime Data reflects 2002 timeframe. SDC Data is based on data being collected in theater from 2004 to August 2006 timeframe.
Strains on Our Current Systems

- Extreme environmental temperatures leading to excessive engine temperatures and fuel consumption
- Excessive weight from the Add-on-Armor
- Excessive amounts of dirt and sand interfering with system operations
- Excessive speeds over rough terrain
- Excessive idling of vehicles based on mission profiles required to meet mission needs
- Lack of scheduled maintenance or incomplete maintenance
- Rough terrain resulting in obstacles impact damage
- Vehicles taking large amounts of ballistic damage

Evolving Threat – An Enemy That Adapts and Learns

- 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

"...Insurgents are always "seeking to achieve higher levels of effectiveness" and these new tactics are part of the normal "evolution of sophistication,"." - Associated Press
Constant Need to Balance System Performance, Protection, and Payload

Original TWV Design
- Performance
- Payload
- Pre 2000

Desired TWV Future
- Performance
- Protection
- Payload
- Post 2000

Buying Protection
- Performance
- Protection
- Current HMMWV

Buying Performance/Payload
- Performance
- Protection
- Tractile

S&T needs to define/achieve "Obtainium" for Light Weight Armor that is affordable or an integrated approach.

Additional Demands for Ground Vehicle Power and Energy

Non-Primary Power
- Thermal
- Communications
- Survivability
- Etc...

Power Needs

Mobility

FY02

FY12

Non-Primary Power

Estimated Electrical Power Growth

Electrical Power (KW)

JLTV
FCS
Stryker
HBCT
HMMWV

Modularity – Design Approach

A-Kit (Structure & Integration Provisions for B-Kit)

Survivability

B-Kit

C4ISR

"Giving the Commander in the Field the Ability to Adapt to Changes...to Mission...to Threat...to Technology!"

Ground Vehicle Systems and Support Equipment – For Today and Tomorrow

Current

- 76 Ton Main Battle Tank
- Unarmored Tactical
- 100% Manned Systems
- Conventional Power Trains
- Passive Suspension
- Steel Track
- Periscopes
- Conventional Armament
- Point-to-Point Voice Communication

Future

- 25-30 Ton Manned Ground Vehicle (PGS MCT)
- Armored Tactical
- Combined Manned/Unmanned Capabilities
- Hybrid Electric Systems w/ Exportable Power
- Active Suspension
- Segmented Band/Back Indirect Vision Driving
- High Power (EM) and Laser Weapons
- Shared Common Operating Picture
- Onboard Water Generation
- Fire-Resistant Fuels
- Laser Protection
- Diagnostics/Prognostics
- Integrated C4ISR

Global Problems Need Global Solution Sets

- NGIC, Field Issues, Data Collection
- Test Lesson Learned
- Near real-time access to theater data
- Ability to assess trends and respond

Integrated Data
- Information and data easily located and accessible - especially needed when communicating and collaborating among globally diverse organizations
- Types of information – product, program, M&S and analysis, SME, Technology
- Requires Government to negotiate access and visibility to all information
- Accessible data from multiple, distributed sources

Quick ability to adapt to changes in threat, changes in advances and changes in technology.

SBIR / CRADA / Outreach Points of Contact

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So how do we get there?

YOU & Partnerships

TARDEC BOOTS
ARE ON THE GROUND