Ceramic Material and Nondestructive Evaluation/Test (NDE/NDT) Needs for Future Vehicle Platforms

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# Ceramic Material and Nondestructive Evaluation/Test (NDE/NDT) Needs for Future Vehicle Platforms

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*Standard Form 298 (Rev. 8-98) Prescribed by ANSI Std Z39-18*
Future Vehicle Platform

Requirements Definition

- Lightweight
- Structurally Capable System Platform
- Blast, Kinetic, and Energetic Threat Capable
- Serviceable and Repairable
- Upgradeable and Spiral Development Friendly
- Other: EMI Shielding, Low Flammability, Heat Dissipating, etc.

Structures/Armor Technologies & System Design

- Low Cost Titanium
- Low Cost High Strength Aluminum
- Blast Dampening Composite Structures
- Ceramic/Polymer Composite Materials
- Ceramic/Titanium Materials
- EM Armor &/or other Energetic Threat Solutions
- System Integration Methods
- Standard Approach to Transition

Mfg Technologies & MTO Project Plan
Armor Manufacturing Technology Objective (MTO)

- Funded Program (FY03 – 09) $120M
- Integrated Process Team (IPT)
  - RDECOM/INDUSTRY
  - Boeing/GDLS/UDLP
- Identify Manufacturing Technology Research
  - Transition to Production for Future Vehicle Platform
Manufacturing Challenges (FY04-09)

- Joining Major Structural Sections of Different Materials i.e. Composite & Metallic

- Integration of Ceramic Armor on Structure
  - Tile Confinement
  - Bonding Tiles to Composite & Metallic

- Metallic Portion of Structure Fabrication Less Significant
  - Still Investigate Unique Joining & Inspection Techniques
  - High Productivity Machining Techniques
Structure IPT Status

- Vehicle Platform Concept in Development
  - Composite floor, mine driven
  - Metallic sidewalls (Ti or Al)
  - Ceramic tile for ballistic protection
  - Mission module(s)
- Composite and/or Metallic
- Material Trade Study in Process
Structural Armor Estimates

- Ceramic Tile Requirements
  - Common Chassis with Mission Module
  - 3K to 5K lbs per vehicle
- Program Requirements
  - Vehicle Production Example
  
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- First year 96,000 – 160,000 lbs
Ceramic Needs

Future Vehicle Platforms

• Cercom Inc. PAD SiC-N Best Performing Material to Date

• Ceramic Tile Manufacturing Challenges
  – Continuous rather than batch processing
  – Production capacity
  – Inspection technique(s)
  – 60% cost reduction

• Focused Effort within Armor MTO to Meet Ceramic Mfg Challenges
Inspection Techniques for Ceramic Tiles

- Silicon Carbide (SiC)
  - Standard 4” x 4” x 1”
  - Processing Defects
Background Slides
FCS-X1 Survivability Configuration

With RO/RO Hull Armor

With Integrated & Add-on Armor