

# Affordable ManTech for Structural A and B(x) Armor

*Provides design/planning tools and manufacturing technologies to expedite and enable high capacity production technologies for critically needed armor structural subassemblies A, composite armor assembly B(x), and B(x) armor materials including armor ceramics, metallics and hybridize composites.*

## OBJECTIVE / SOLUTION

This project will provide advanced, affordable vehicle integration and armor system/materials manufacturing technologies for next generation Ground Combat Vehicles (GCV) including:

- Model Base Environment (MBE) to enable seamless annotation in coupling Computer-Aided-Design and Computer-Aided Manufacturing Planning/Processes
- Build-to-Print Ceramic Armor Laminates
- Affordable production of advanced armor materials (e.g. silicon carbide-SiC, metal laminates, metal matrix composites and 3D weave composites)

## ACHIEVEMENTS

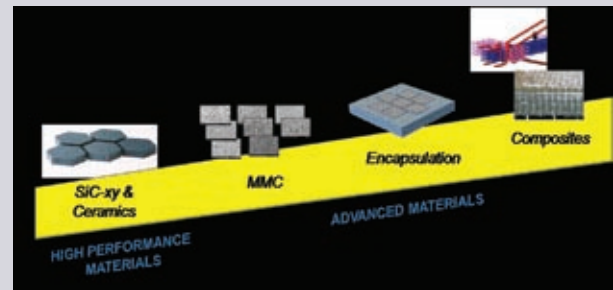
- Established robust design and manufacturing collaborative environment in use for creation and maintenance of GCV design and manufacturing data
- Initiated transition of MBE capabilities to Depots
- Developed Friction Stir Welding technologies for thick-section ballistic lower hull
- Lowered the cost of armor SiC from \$135/lb. to \$55/lb. via a semi-automated hot pressing, high speed machining and advanced preforming techniques
- Constructed Jacquard looms to initiate 3D ballistic fiber weaving operation and fabrication
- Establish semi-automated assembly of Build-to-Print armor ceramic sheets and achieved 70% labor reduction

## BENEFITS

- Provides lighter weight, survivable platforms with light affordable armor that meets Office of Research and Development (ORD) requirements
- Reduces design-to-production cycle time and cost of manufacturing by 25-40%

## STATUS

- A ballistic hull demonstrator is being designed and built to verify production practices for MBE and Friction Stir Welding methodologies in FY10
- Net-shape finishing procedures and armor-to-vehicle integration specifications for Build-to-Print armor ceramic sheets are being developed, guidelines will be established in FY10
- Efforts to further reduce the cost of armor grade SiC to \$35/lb. and to increase capacity by 3x is scheduled for completion in FY11



B(x=3) Armor Materials



Semi-automated  
Armor Ceramic  
Assembly

- Feasibility in developing low cost casting capabilities for metal encapsulated armor ceramic modules has been demonstrated and will be established by FY11
- Largest wrought plate of metal matrix composites (>40 in. wide) has been demonstrated and the process will be further refined toward optimizing properties
- Largest nano-aluminum TriModal composites billet suitable for plate production has been fabricated. Thermomechanical methodologies are being developed to reduce the billets to wrought plates
- Coupling of 3D weave design with loom machine instructions for flexible manufacturing is being developed

## WEAPON SYSTEMS / SECONDARY ITEMS IMPACTED

- All present and future ground combat vehicles requiring armor and protection upgrades
- Advanced armor materials for the Individual Warfighter Protection

## POTENTIAL COST AVOIDANCE

- Return on Investment of 17.4:1 with a cost benefit of \$1,082B