Transparent SPINEL Armor Manufacturing Scale Up

Scale up of manufacturing capabilities to produce large, transparent SPINEL armor windows and SPINEL plates for other applications.

OBJECTIVE / SOLUTION

There is a compelling need to reduce the cost to produce large, transparent ceramic armor windows to provide lighter weight improved ballistic protection for tactical vehicles. Recent ballistic experiments on ceramic based armor against advanced threats at Aberdeen Proving Ground have demonstrated multi-hit performance at weights and thicknesses 50-60% less than currently deployed glass-based armor. Direct spin-offs for rotorcraft and anti-tank airborne vehicles would become feasible.

ACHIEVEMENTS

The interchangeability of SPINEL and aluminum oxynitride (ALON) in armor designs has been demonstrated.

BENEFITS

Improved multi-hit protection against current and emerging threats:

- Light weight transparent armor in sizes up to 16” x 40”
- Weight savings and thickness reductions of 50-60% over current systems
- Reduce cost per square foot by 20-50% for SPINEL ceramic plates for armor
- Superior resistance to scratching, sand erosion and fracture due to rock strikes will provide major replacement cost avoidance payoffs
- Operations and Support (O&S) cost savings will be achieved as a result of reduced vehicle maintenance and increased window service life
- Reduce SPINEL manufacturing costs by up to 50%.

STATUS

- Demonstration of volume manufacturing process of SPINEL and ALON plates for integration and government certification of low-weight transparent armor solutions to Level 3A threats IAW ATDP 2352 is ongoing
- The ballistic performance of SPINEL from 3 separate manufacturers, as well as ALON is being evaluated
- The size of hot-pressed ceramic plates available for DoD applications has been increased from 170 to 400 in²
- The ManTech spinel production line at Technology Assessment and Transfer (TAT&T) has transitioned to a low-rate initial production (LRIP) capable transparent armor integration line at ARMORLINE. ARMORLINE is funded by private investments
- ARMORLINE Facility: 257K sq ft., Target date for full scale production (230 Metric tons a year) - 4QFY12
- CoorsTek Armor Solutions and BAE Advanced Ceramics continue to develop manufacturing processes for SPINEL and Surmet continues to develop manufacturing of ALON

WEAPON SYSTEMS / SECONDARY ITEMS IMPACTED

- This ManTech program will enable ceramic based transparent armor to be fabricated in sizes large enough to meet vehicle dimensions including Heavy Expanded Mobility Tactical Truck (HEMTT) and Family of Medium Tactical Vehicles (FMTV)
- Coordinated with Army’s Long Term Armor Solution program
- Other potential platforms include Army, Air Force, Navy, and Marines systems
  - F18 - Advanced Targeting Forward-Looking Infrared (ATFLIR) and SNIPER XR Targeting Pod
  - Navy DDG-1000 Destroyer
- Potential to impact rotorcraft, airborne vehicle, and infrastructure protection throughout the US military

POTENTIAL COST AVOIDANCE

- Return on Investment of 8.7 to 1 with a cost benefit of $68M