

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 scale up the manufacturing capabilities to produce large, transparent SPINEL armor windows to provide lighter weight improved ballistic protection for Heavy Expanded Mobility Tactical Truck (HEMTT), Family of Medium Tactical Vehicles (FMTV), and other tactical vehicles. With tactical platforms already exceeding design limits for weight, boosting the ballistic efficiency of transparent armors using traditional approaches is impractical and demands new technology to meet advancing threats.

Recent ballistic experiments on ceramic SPINEL-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. Some current operations vehicles are using hard ceramic windows on the order of 170 in² to meet operation requirements. However, delivery of >200 in² of ceramic armor is beyond current commercial practice. Production of 640 in² front windows for HEMTT, as well as 464 in² for FMTV vehicles, represents the pinnacle of an enabling technology in transparent ceramic armors since no existing capability exists. A number of tactical vehicles, armored personnel carriers, and combat vehicles would also benefit from reduced weight and the enhanced protective capabilities of SPINEL-based armored windows. Direct spin-offs for rotorcraft and anti-tank airborne vehicles would become feasible.

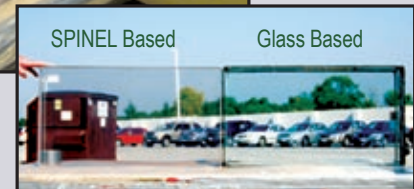
BENEFITS

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%



Segmented
16" x 29" SPINEL
Window



STATUS

- Program is in its third year of funding
- Segmented 16"x29" SPINEL front window was delivered for FMTV road test
- SPINEL plates are being delivered to Tactical Wheeled Vehicle ATO for ballistic testing and armor development
- The size of hot-pressed SPINEL plates available for DoD applications has been increased from 170 to 300 in²
- The increase in the size and quality of hot-pressed SPINEL available has allowed the following:
 - The Navy is flight testing hot-pressed SPINEL for a window for the new AN/ASQ-228 Advanced Targeting Forward Looking Infrared targeting pod (AT-FLIR) being developed for the F18. A SPINEL window has been delivered and is scheduled for flight testing between August 2009 and December 2009
 - Lockheed Martin is evaluating hot-pressed SPINEL for insertion as a lens into the aircraft mounted SNIPER XR Targeting Pod
 - The Navy is evaluating hot-pressed SPINEL for IR windows on new DDG-1000 destroyers
 - NASA is evaluating SPINEL as the primary window for the next generation versions of the low earth orbiter, the moon orbiter and the Space Shuttle crew exploration module

WEAPON SYSTEMS / SECONDARY ITEMS IMPACTED

- This ManTech program will enable SPINEL transparent armor to be fabricated in sizes large enough to meet vehicle dimensions including HEMTT and FMTV
- Coordinated with Army's Long Term Armor Solution program
- Other potential platforms include Army, Air Force, Navy, and Marines systems
 - F18 (AT-FLIR 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 8.7:1 with a cost benefit of \$68M