DuPont™ Kevlar®
TECHNOLOGY FOR ADVANCED VEHICLE ARMORING
To protect the occupants, today’s armored vehicles need advanced armor systems that do not penalize the vehicle's performance. An effective vehicle armor system must be capable of providing multi-hit protection and maintaining the ballistic capability through a wide spectrum of operating conditions, such as exposure to high temperatures. Flexibility in design, ease of fitting and retrofitting, superior durability and low bulk are further essential requirements. Last, but not least, the armor systems must provide a truly cost effective solution.

Lightweight armor systems made with DuPont™ Kevlar® brand fiber optimize these essential properties in advanced ballistic protection for vehicles. Designed to meet a broad range of protection requirements, solutions containing Kevlar® offer the flexibility and choice necessary to accommodate varying weight, bulk and threat level constraints. Advanced armor systems using innovative Kevlar® technologies are a preferred choice for durable, reliable and cost-efficient protection.
Advanced armor panels made with Kevlar® give the following advantages:

**Fire and flame resistance**
Kevlar® fibers do not melt and are inherently non-flammable unlike polyethylene and polypropylene. And Kevlar® fiber (LOI of 28%) meets NAVSEA requirements for flame, smoke and toxicity; will not act as a fuel source; and will not sustain combustion. This extra measure of safety is of particular importance in an overmatch situation when composite ballistic armor panels are perforated and delaminated.

**Lower life-cycle cost**
Armor systems made using Kevlar® can help reduce weight, allowing for reduced fuel consumption, higher payloads and increased maneuverability. Compared to heavier materials such as fiberglass, steel and aluminum, Kevlar® helps provide better protection at a higher weight. In fact, Kevlar® is now offered in unidirectional (UD) structures. These higher performing structures with Kevlar® are qualified for the pending unidirectional (UD) MIL spec. Currently, RPG nets made with Kevlar® are being fielded, delivering weight savings of thousands of pounds when compared to conventional RPG armor.

**Superior durability at extreme temperatures**
Once installed inside a vehicle, armor panels can experience temperature extremes from −52° to 100°C and must retain all ballistic properties. Armor panels next to the engine may be exposed to even higher temperatures. It can be extremely dangerous to use armoring materials that deteriorate, change, or lose their ballistic performance when exposed to such temperature extremes. Kevlar® brand fiber offers excellent thermal stability and can be used continuously at temperatures above 120°C without loss of performance.

**Lightweight solutions for design and installation flexibility**
The lighter and thinner the armor system of a vehicle, the fewer constraints there are to the manufacturer and to the performance of the vehicle. A thicker armor panel leaves less room for cables, hoses and other functional devices. Kevlar® allows for a thinner, lighter armor system.
In other areas further from the center of gravity, weight strongly affects maneuverability. The advanced composite panels made with Kevlar® are easy to shape and adapt to almost any vehicle body, making installation simpler, quicker and less costly. Kevlar® can be used in a range of armor solution forms; from soft structures such as a lightweight spall blanket up to structural panels. In addition, panels made with Kevlar® adhere better to other materials such as plastics, steel and ceramic when compared to polyolefin materials.

**Durable protection**
Modern military vehicles are expected to remain in service in abusive environments for decades. Kevlar® stands up to this test. In a recent study, Kevlar®-reinforced spall liners were removed from Bradley Fighting Vehicles returned from theater for inspection and refurbishment. The spall liners had been in service for at least 20 years.

These spall liners, specifically selected for excessive damage, all showed ballistic resistance far above the requirements for new spall liners (MIL-DTL-62474). More impressively, their average performance was equivalent to the expected performance of new spall liners. This underscores the real world, durable protection offered by armored components made of Kevlar®.
**Key advantages of armor made with Kevlar®**

- Optimum ballistic performance versus weight and cost
- Inherent fire and flame resistance
- Proven performance over a wide range of temperature extremes
- Reliable and durable ballistic protection
- Proven field performance over time

Kevlar® has not only been included in the Bradley Fighting Vehicle for the US military for the last 20 years, but also over a wide range of vehicles such as RG-31 and RG-33 MRAP, Stryker, M113, Breacher, Paladin, C-5, C-17, C-30, HMMWV, and more. Kevlar® based products offer proven solutions because of their performance and reputation.

Kevlar® technology brings innovative proven protection solutions capable of addressing a wide range of threats. And now, new higher performing unidirectional structures with Kevlar® are qualified for the pending MIL spec. Armor systems made with Kevlar® brand fiber are the lightest, most durable, reliable, flame-resistant and high-value choice for a range of vehicles, ships, airplanes and helicopters.
Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user’s responsibility to determine the level of risk and the proper protective equipment for the user’s particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DUPONT MAKES NO WARRANTIES AND ASSUMES NO LIABILITY IN CONNECTION WITH ANY USE OF THIS INFORMATION. Nothing in this publication is to be considered a license under or any recommendation to infringe any trademark or patent right.

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