Study and Experimentation of Composite Armor against Small Arm Threats

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ABSTRACT:

The purpose of this study was to gather a better understanding of composite materials and their applications as armor. Composites themselves come in various materials. Generally a good material for composites will be light weight, high tensile strength and durable material. Carbon fiber, S-2 glass, Kevlar and ballistic nylon have these properties and are used extensively. The ballistic properties of composites come from the many layers or plies that stiffen. My study showed me how to create and test armor made out different materials.

The simplest composite armor solution is to take a traditional armor like ballistic steel and adhere a spall catching layer behind it, like Kevlar or S-2 glass. A more complex solution might be to have a very hard layer of ceramic tiles to break up the projectile, followed by a milder steel layer to catch fragments of both the round and ceramics, and finally a layer of S-2 glass. For even more protection, a layer of high hardness steel applied to the outer edge will help to protect the ceramics from small arm threats and a final a last chance plate of aluminum or steel again at the end. Composite armors are generally more effective than a straight metal solution alone.

For my study, I designed and tested composite armor panels against current threat systems. Primarily, I concerned my study to defending against small arms fire and IED's, the two most prevalent weapons of insurgents. Testing was conducted with actual rounds entering the armor at extreme close range as well as detonating IED's in close proximity to the armor. Afterwards, the scientists and I judged the armor on how well it defeated the threat, if it did at all, and used that data to design better armor.

KEYWORDS: IED, composites, armor, RPG, ceramics, survivability

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