

White Paper

Superior Security and Defense in the Age of Terror:

*How a Unique Modular System of
Advanced Anti-Ballistic Composite Can
Save Lives and Protect Assets*

16 December 2004

By Leslie Duke
Chief Technology Officer
Ballistics Research, Inc.
706.292.0513

BALLISTICS RESEARCH, INC.
ROME, GEORGIA

Introduction

The rise of terrorism in the U.S. and throughout the world presents difficult challenges to those responsible for protecting the safety of people and the integrity of important government, military, and industrial facilities.

Car bombings, improvised explosions and other attacks destroy lives, limbs and resources daily. Government buildings and military facilities are under constant threat, as are financial centers, petroleum producing facilities and pipelines, chemical plants, nuclear power plants, and countless other potential targets.

This paper describes an innovative development with primary benefits to the defense department, as well as government, industrial and homeland security sectors. The development, called the **3-D Interlocking Protective System (3-D IPS)**, can be used in permanent, semi-permanent, and mobile installations to significantly increase protection for personnel, buildings, assets, and facilities against many modes of attack, including rocket-propelled grenades, car bombs, improvised explosive devices, and pipe bombs, as well as fire from automatic weapons, shotguns and handguns.

The 3-D IPS, as well as other forms of the **Advanced Anti-Ballistic Composite (AABC)** material from which it is made, have significant applications in several secondary market sectors as well, including law enforcement, emergency management, and sport or target shooting. These applications are also addressed.

The Need

People need protection. At home and abroad, Americans in particular — and people around the world in general — are on edge. We're reminded nearly every week that sudden and savage attacks, completely unexpected, may come at any time.

Innocent civilians may be at risk because they are at work or simply because they are in the wrong place at the wrong time. Buildings across America and around the world that are the most attractive terrorist targets need better physical protection.

The soldiers, officials and others who spend every day and night in high-risk facilities, for example at the bases, hotels, and office buildings of Iraq, desperately need more effective protection from car bomb and other attacks.

Soldiers, especially in close combat, need the best possible mobile bunkers. They need a way to quickly assemble highly protective cover that is durable and easily broken down for rapid mobility.

Domestic buildings, facilities, and the people within need protection. Government buildings, financial and health institutions, chemical plants, military outposts both at home and abroad, as well as other potential targets too numerous to name, badly need greater protection against bomb blasts, rocket-propelled grenades, automatic weapons fire and other means of attack.

Petroleum production and distribution units and systems need protection. Oil field facilities, refineries, thousands of miles of petroleum pipelines, and thousands of pumping stations must be secured. One or two successful strikes against the world's energy system could conceivably send the world's economy reeling and compromise the nation's capacity for defense.

The conventional types of protective barriers and barrier materials now in use are plagued with a variety of shortcomings.

For example:

- No barrier materials currently in use may be vertically stacked to raise the barrier's protection level.
- Most barrier materials degrade seriously or disintegrate in the face of sustained attack from small arms, rocket-propelled grenades, or explosive blasts, and thus lose effectiveness.
- Security against terrorist attacks is difficult to establish for buildings. Protective barriers that are durable and truly effective often must be custom made at enormous cost, whether they are retrofits or part of new construction.
- Most barriers cannot be quickly and easily configured to meet the size and shape need at hand, nor can they easily be reinforced when and if the need arises.
- Many types of barriers require the availability of local resources such as sand, or water, as well as installation times that are sometimes unacceptably long. These problems can be disastrous when the need arises for quick construction of bunkers, for example in an urban warfare setting.

- Other possible solutions are usually too heavy and/or bulky to facilitate the mobility that is essential in security systems that may be used in close combat, and even when deployed as permanent or semi-permanent shields, heavy and bulky materials place undue strain on transportation resources.
- Most mobile barriers can be expected to require tools (sometimes specialized), lifting equipment, and/or specialized training for installation.

A Solution

A solution that will fill the needs and overcome the problems cited above is the **3-D Interlocking Protective System (3-D IPS)**, developed by Ballistics Research, Inc. The 3-D IPS consists of a unique system of interlocking cubic modules made of a new **Advanced Anti-Ballistic Composite (AABC)**.

Advanced Anti-Ballistic Composite (AABC)

AABC is a new, patent-pending, composite polymer material with a very high strength-to-weight ratio. It is capable of stopping and safely absorbing projectiles from small arms fire and every kind of conventional (non-nuclear) explosive device.

Typically, materials used to shield against attack, especially those not too heavy for practical transport and installation, degrade under fire. AABC, by contrast, absorbs and encapsulates projectiles, and actually gains density as a result. In testing, several small blocks of AABC that have each absorbed more than 6,000 rounds of various weapons

fire and shotgun slugs show that the trapped projectiles actually increase the material's strength and protective character.



Projectiles that strike AABC directly in line with previous hits continue to be absorbed into the material, where they “back-stack.” The result of back-stacked bullets is shown in the photo at left. Nine .45 caliber slugs that were fired one after another into a single point on a piece of AABC are shown.

Barriers of AABC 12” and thicker provide protection against the most common explosive and small arms threats. The material’s capacity to safely absorb projectiles is not compromised by any kind of explosive shock. A 12” cube of the material weighs approximately 45 to 65 lbs., depending on the density required for its specific application.

AABC (12” thickness) has been successfully tested against the following weapons:

- 5.56mm (M16) FMJ, HP, AP & Tracer
- 7.62X39 (AK-47) FMJ, HP, AP & Tracer
- .308 FMJ & AP
- .30-06 FMJ & AP
- .300 Win Mag SP & HP
- 7mm Rem Mag SP & HP
- .50 BMG FMJ & AP
- All known shotgun rounds
- All known handgun calibers

Additionally, AABC (in 12” thickness) has been successfully tested against the following blast ordnance:

- Detonation cord
- “Pineapple” IED fragmentary grenades
- Other improvised explosive devices
- Pipe bombs

In another test, a 6” thickness of AABC successfully protected against a blast from 6.5 lbs. of military dynamite. That explosion replicates the force of a direct strike from a rocket-propelled grenade.

AABC is fire resistant. It does not support combustion, and can be made fire proof if desired. It is impervious to petrochemicals, salt water, and UV rays.

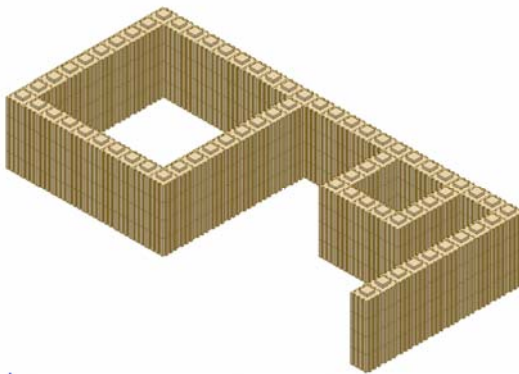
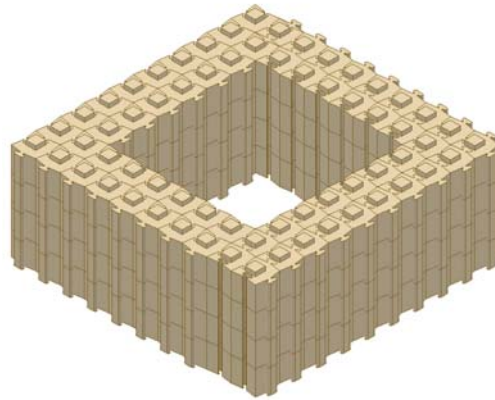
Because AABC encapsulates and contains bullets and other projectiles, it prevents lead and other toxins from escaping into the environment. The material itself leaches no toxins and is not damaging to the environment.

Manufacture of the AABC material is not limited to the cubic modules described in the following section. It can be produced in any shape in which its properties are desired. For example, an office desk produced wholly or partially from AABC could be utilized for personal protection in the event of attack.

Interlocking cubic modules

Interlocking cubic modules made from AABC, the patent-pending “building blocks” of the 3-D IPS, are produced in virtually any size. For example, some applications may call for cubes that measure 10” X 10” X 10”, while other applications may be better served by a system that utilizes very large modules of one cubic yard (36”).

Each module interlocks on all six sides with any other cube of the same size, affording the installer speed of assembly and flexibility in configuration. No tools or formal instructions are required for assembly, and every cube of the same size is identical to all its mates; There are no special corner modules or end caps.



Interlocked cubes form extremely strong structures built to any desired size and configuration, with walls of any thickness. After use, the modules are disassembled and stored or transported for reuse.

The 3-D IPS may be used to shield bunkers, buildings, pipelines, pump stations — any critical need equipment or installation that requires protection

from ballistic or explosive attack. Military units with a need for permanent, semi-permanent or highly mobile physical security may find the modules convenient and valuable.

Existing buildings are easily and quickly protected with the 3-D IPS, and the system may find favor in new construction applications as well.

Secondary applications

In addition to military applications and improvements to homeland, government, and industrial security, the 3-D IPS and/or the AABC material in alternate forms may be found to be beneficial in several important secondary sectors. Three such market segments are law enforcement, consumer markets catering to sport shooters, and emergency management agencies.

Law enforcement and civilian sport shooters may benefit from the ability of AABC to improve firing ranges in several respects.

AABC may be useful in training targets, bullet traps, live-fire shoot houses, and firing ranges, both indoors and outdoors. The material is suitable for targets and backstops, as well as along sidewalls, to capture stray projectiles in any range configuration.

Problems with shooting ranges and target facilities, such as those used by law enforcement, commercial operations and private shooters, include potential ricochet, limits on safe shooting distance, restrictions on permissible bullet type and cartridge load, and environmental contamination issues, especially involving spent lead.

AABC targets and backstops can permit target training from any distance, including point-blank range, as well as training with actual duty ammunition.

The material captures projectiles fired from extreme oblique angles, virtually eliminating ricochet.

Because it captures and keeps projectiles encapsulated, use of the AABC material on a firing range completely eliminates the high costs associated with conventional lead contamination avoidance and/or the cleanup of lead.

AABC material that becomes super saturated with lead after long use can be removed and reprocessed to allow for separation and recycling of the anti-ballistic material and the captured lead.

Emergency management agencies and others who have previously used sandbags or earthen barriers for flood protection may be surprised at the rapid deployment possible with 3-D IPS and find the system superior to other methods of controlling floods and preventing beach erosion.

Summary

The realities of today's violent world require extraordinary efforts to protect people, buildings, and myriad other potential terrorist targets such as oil pipelines and nuclear power plants.

Previously available physical security barriers are handicapped by numerous and significant shortcomings.

In response to these needs, Ballistics Research, Inc., offers Advanced Anti-Ballistic Composite and the 3-D Interlocking Protection System, which may overcome those shortcomings and prove vitally useful to security and defense efforts in the age of terrorism. The new material described in this paper, especially when used in the form of the interlocking modular system, can be expected to provide a higher level of physical security for government, commercial and private facilities and the people and assets within, along with marked advantages on the battlefield and in the security of those in and around zones of chronic conflict.

Additionally, a number of significant secondary market segments are likely to benefit from these developments as well.