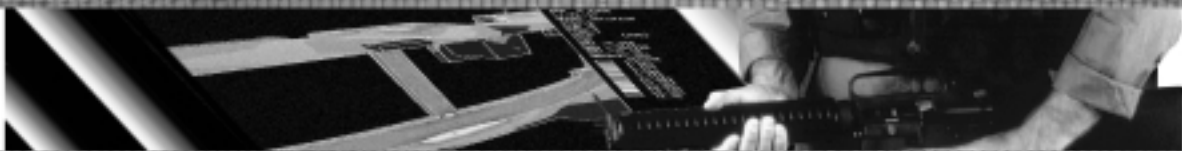


# S-2 Glass<sup>®</sup> Armor Systems



Personnel Protection



Vehicle Protection



Structural Protection





## *S-2 GlassArmor Systems*

Stronger. Tougher. Better.

*S-2 Glass* armor systems, based on *S-2 Glass* fiber from AGY, are the no-compromise solution for the full range of commercial and public safety applications.

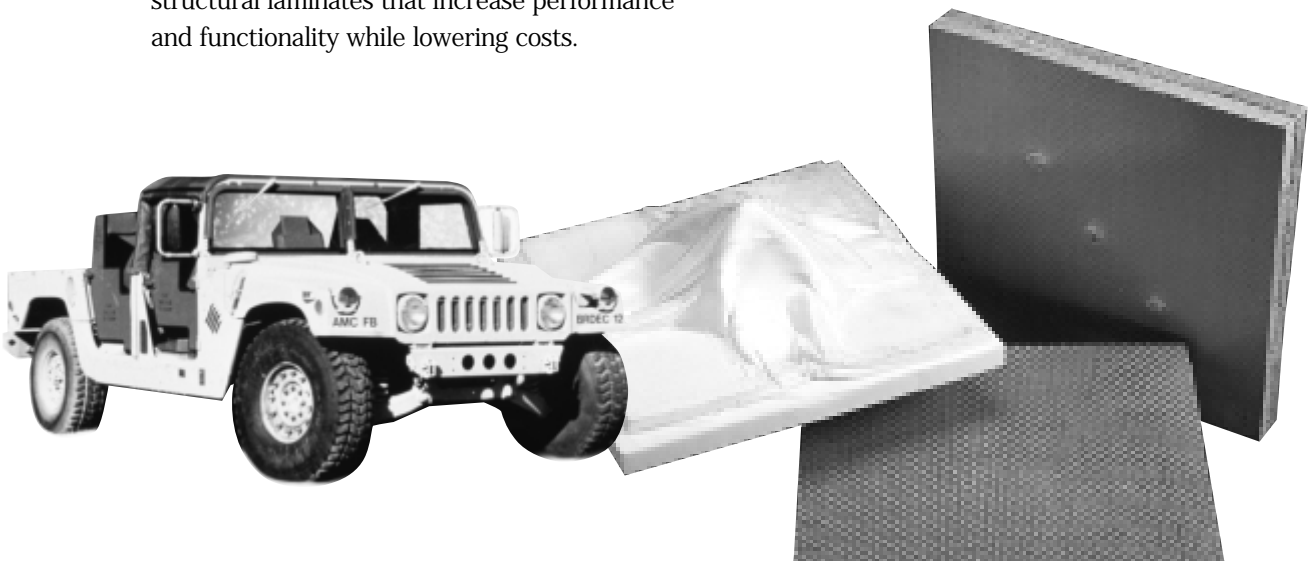
Proven in more than 25 years of demanding military applications and ballistic protection systems, *S-2 Glass* technology is the higher performance, higher value choice.

*S-2 Glass* composite systems combine a unique balance of exceptionally high performance across a wide spectrum of critical mechanical properties – including strength, impact and structural characteristics.

*S-2 Glass* technology provides the distinct ability to design lighter weight, thinner wall, structural laminates that increase performance and functionality while lowering costs.

Utilizing a systems approach to address new program requirements, AGY is able to recommend integrated solutions to complex challenges. We recognize and understand the relationships among design and process elements, and strive to assist in the optionization of these elements to our customers' advantages.

Additionally, AGY further leverages our capabilities through selective integration with industry resources for added value in technical and application development. Utilizing this integrated systems approach permits the simplification and acceleration of integrated solutions to complex challenges.





## Hit Us With Your Best Shot

From military rocket motor housings to combat vehicle hulls and from composite inserts for ballistic vests to ballistic armor door protection systems, *S-2 Glass* armor from AGY has met the threat to personnel and equipment.

In the past 10 years, *S-2 Glass* systems have been qualified and specified on nearly every major U.S. military armored vehicle system.

In addition, numerous innovative technology development programs have used the unique capabilities of *S-2 Glass* armor systems to act as both a ballistic and a structural material. Appliqué armor, blast mitigation systems and combat vehicle structures have been constructed of this exceptional material.

With other material systems there is typically a trade-off between ballistic and structural properties in a laminate. *S-2 Glass* armor systems provide both. Optimized for ballistic protection, *S-2 Glass* systems also have a significant residual structural load-bearing capability. This structural capability makes

*S-2 Glass* armor well-suited as a weight and space efficient backing for ceramic faced armor systems where multi-hit capability is critical.

Moreover, the ability to design applications with thinner walls permits the use of less *S-2 Glass*

fiber to do the same job as other materials. It can also help reduce the weight, as well as the cost of the protection system. That economic advantage of *S-2 Glass* armor systems can help extend your buying power to protect more personnel at higher protection levels.

Today, AGY continues to assist in the development of advanced ballistic resistant systems to shield law enforcement and

commercial security personnel. *S-2 Glass* systems stand up to the threat of direct small arms fire and they also meet the protection needs against the shrapnel and fragments created by exploding mines, grenades and other blast-induced threats.



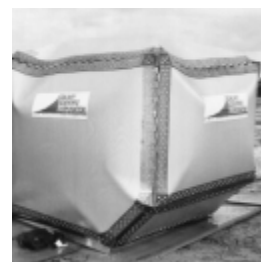
The CAV100 U.N. armored vehicle relies on *S-2 Glass* composite for its vehicle structure.



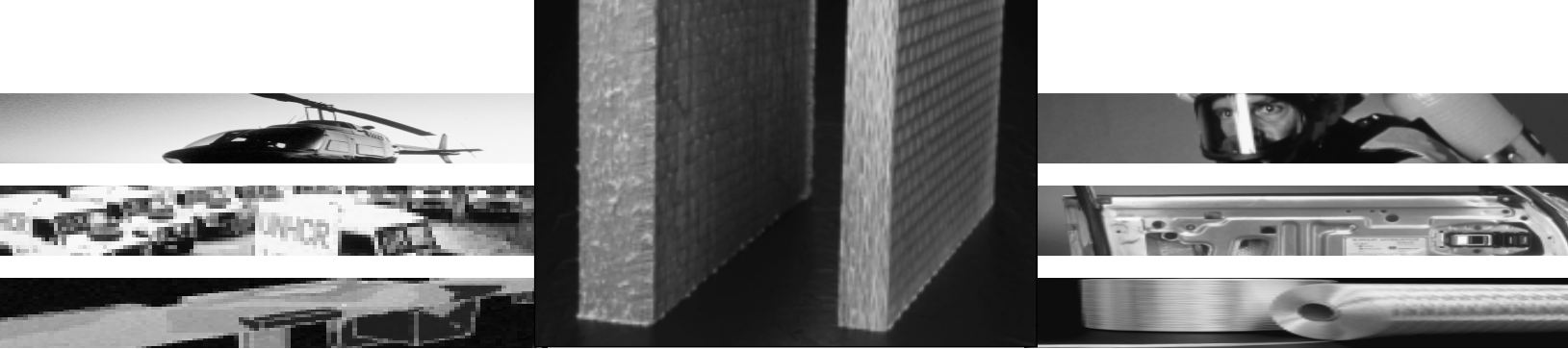
The CAV-ATD replaces traditional all-metallic tracked vehicle chassis with one built of *S-2 Glass* reinforced composites.



High-strength *S-2 Glass* armor systems can be deployed throughout a vehicle to optimize protection, structure and economic value.



*S-2 Glass* reinforcements enable this blast-resistant fiber-metal laminate, GLARE® aircraft container to increase survivability in an explosion.



The *S-2 Glass* ballistic panel on the right weighs the same 5 ft/lbs<sup>2</sup> as the aramid panel on the left. Both provide the same ballistic protection, but the aramid panel is approximately 50 percent thicker than the comparable *S-2 Glass* laminate – a critical difference where space is important.

## The Strength to Go the Distance

Laminates made from *S-2 Glass* fiber provide an inherent balance of tensile, compressive, stiffness and fatigue properties, as well as the ability to perform as a ballistic material.

And, *S-2 Glass* laminates can be developed from polyester, phenolic, vinyl ester or epoxy resin systems which allow you to tailor the material for specific application and cost

requirements. Each system offers unique benefits to meet your specific needs. The polyester systems are easier to fabricate and less expensive. Phenolics provide low flammability and low smoke generation. Vinyl ester can improve mechanical properties and weatherability. Epoxy systems are used where exceptionally high structural properties are needed.

The broad performance profile of *S-2 Glass* fibers provides the critical properties for demanding applications:

<b>High-Strength</b>	Consistent, high tensile and compressive strength for durability and reliability
<b>Impact Resistance</b>	Better fiber toughness, modulus of resilience and impact deformation for higher durability and damage tolerance
<b>Temperature Resistance</b>	Retains greater fiber tensile strength and stability at elevated temperatures far beyond the point of initial matrix degradation. The fiber itself does not contribute to flame or smoke generation
<b>Stiffness</b>	Delivers 25 percent more linear-elastic stiffness than E-Glass
<b>Fatigue Resistance</b>	Parts can withstand flexural fatigue and a major ballistic impact without catastrophic failure
<b>Environmental Resistance</b>	Stands up to corrosive and aggressive chemicals as well as weather and its elements



## Commitment to Excellence. A Commitment to You.

*S-2 Glass* fiber, the backbone of these composite armor systems, is one of AGY's most advanced materials. These systems are designed to provide high reliability and value with no compromise in performance or quality.

Our commitment to customer satisfaction is built on the same foundation of no-compromise. We are eager to work with you as you develop your application.

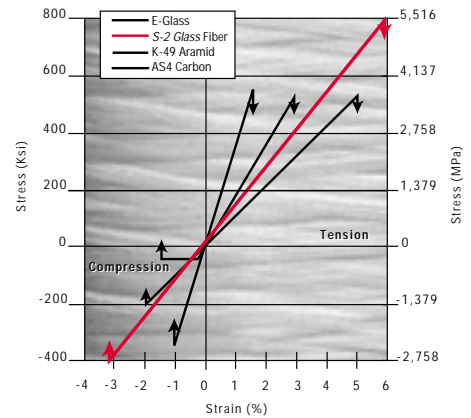
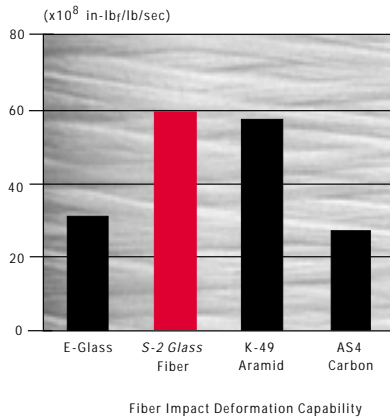
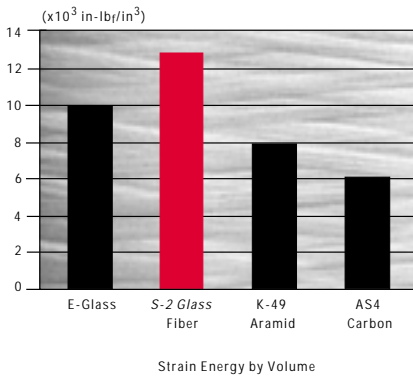


For commercial defense applications, turn to AGY for technological innovation and materials expertise that have driven higher performance and higher value in applications across every major industry.

Call AGY today for more information including case studies, technical data sheets and technical papers describing why *S-2 Glass* armor systems are your better choice for performance and value...

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E-Glass, S-2 Glass, K-49 Aramid, AS4 Carbon  
Tension Stress Strain

E-Glass, S-2 Glass, K-49 Aramid, AS4 Carbon  
Modulus of Resilience  
Tensile Modulus x Strain to Failure

## Compare the Better Choice... S-2 Glass Armor

When you compare S-2 Glass armor systems to alternative materials, the choice becomes easier:

Vs. Aramid-Reinforced Materials

- Equivalent ballistic protection at comparable weight
- Lower finished part costs
- Excellent fire and smoke performance
- Thinner parts
- Easier fabrication and finishing
- Greater residual structural capability
- Potential for reduced back face deformation
- Superior resistance to environmental degradation (UV, moisture)

Vs. Ultra High Molecular Weight Polyethylene-reinforced Materials (UHMWPE)

- Lower finished part costs
- Excellent fire and smoke performance
- Thinner parts
- Easier fabrication and finishing
- Significantly improved structural capability
- Potential for reduced back face deformation
- Superior resistance to environmental degradation (Heat stability)

Vs. Steel or Aluminum

- Lighter weight
- Higher degree of consistent ballistic performance
- Corrosion resistance
- Ease of fabrication
- Parts consolidation
- Low dielectric constant
- Lower coefficient of thermal conductivity, permitting more effective IR signature management
- Inherently non-spalling
- Opportunity for lower total combat vehicle hull manufacturing costs once economies of scale are recognized



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For more information, visit our Web site at [www.agy.com](http://www.agy.com)

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