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A-A-R-V

ANTI-AMBUSH-RETELLIATION-VEHICLE

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Fig 1



Fig 2

PROBLEM ANALYSIS

Ambush attacks in conflict zones are a significant threat, aimed at destabilizing regions and causing fear and casualties. These attacks often target high-profile locations like highways, military convoys, or pilgrimage routes, using tactics such as suicide bombers, IEDs, or gun battles. Many incidents have constant been faced by both security forces and civilians. Attackers often have deep knowledge of the terrain, making it difficult to defend against such ambushes. These incidents underscore the need for better security measures, including armored vehicles, improved intelligence, and stronger coordination between military and local law enforcement.

NEWS ARTICLES

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Fig 3



Fig 4



Fig 5

PAMPORE AMBUSH: 8 CRPF jawans killed after militants attack convoy. (25/06 2016)

A brutal ambush on a CRPF convoy in Pampore resulted in the deaths of at least 8 CRPF personnel and left over 20 others injured, several critically.

AMARNATH AMBUSH: Pilgrims killed on way to spirituality

The assailants fired upon the bus, resulting in the **deaths of 8 pilgrims** and **injuries to at least 18 others**. The victims were primarily from all over the country

PULWAMA AMBUSH: 40 CRPF jawans targeted in devastating suicide bombing. (14/02/ 2019)

In a devastating attack on a CRPF convoy in Pulwama, Jammu and Kashmir, **at least 40 personnel lost their lives**, and **over 30 others were injured** in a suicide bombing.

PROPOSED SOLUTION

In order to prevent these bidirectional ambush attacks, we have designed specialized vehicle attachments which can withstand these kind of attacks. Our system consists of bullet proof composite materials which may withstand various caliber impacts. This system can also provide us crucial time to retaliate or escape. The mechanism of action of our system is the specialized composite material to absorb the impact of projectile to minimize the damage .The system has retractable plates to change angle of deflection and to bind up the system to increase mobility. This system can also be attached on pre-induced military buses. In a more advanced AARV system for military there are a range of optical sensors and communication units. The design of windows are specialized to restrict the entry of projectiles . The composite shields are operated by means of hydraulic or pneumatic mechanisms which guards the window when under attack.

METHODOLOGY

Problem Analysis

Gather information about the problem and working on its advantages and disadvantages

Research & Simulation Validation

The basic principle, on working of the model and theory behind it.

Final Prototype

The proper material usage for the sheet helps increase the convoy's survival rate compared to present-day solutions.

MECHANISM

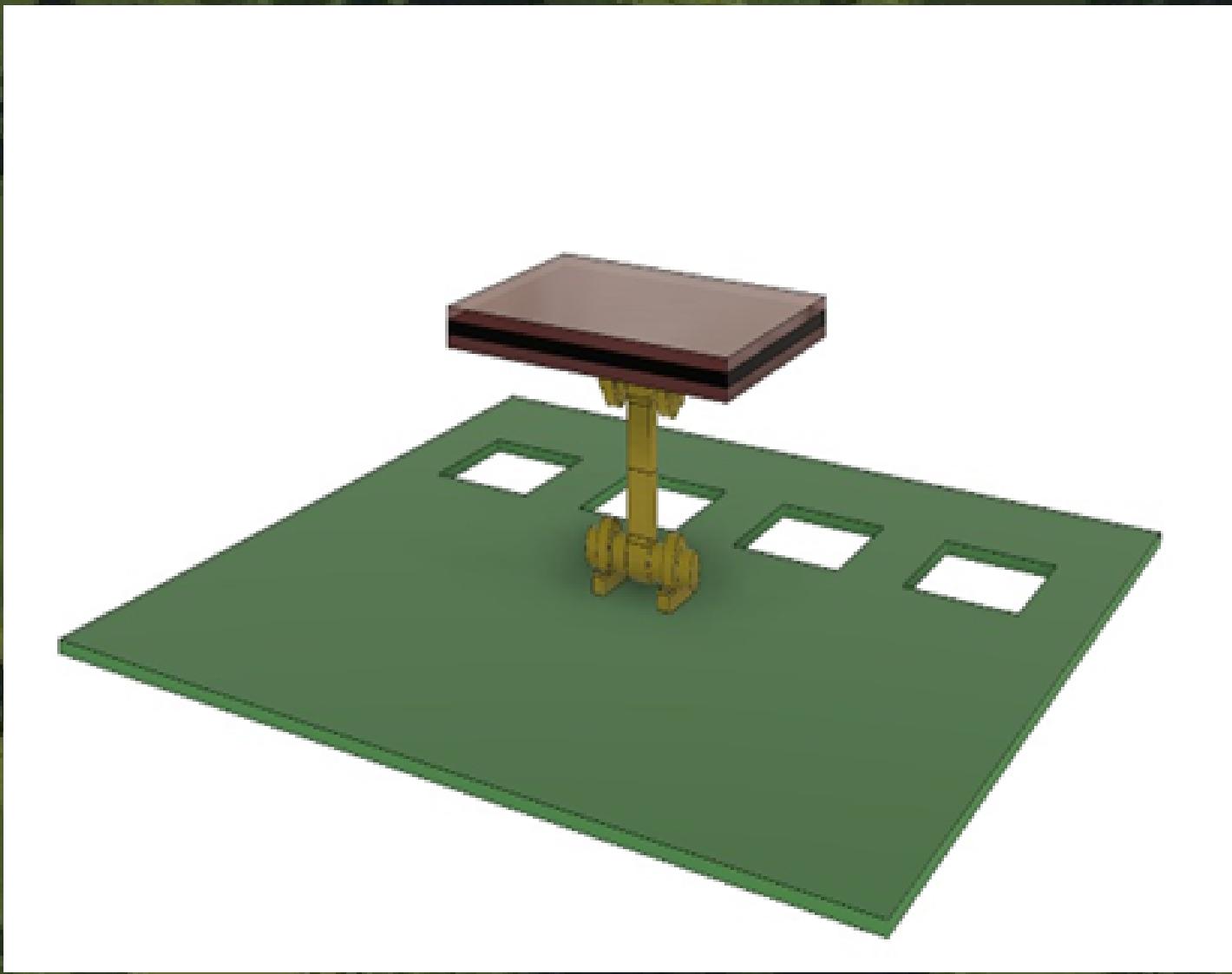


Fig.6

The composite material shield is attached to a hydraulic system, which keeps it positioned below the bus window under normal conditions. In the event of an ambush, the hydraulic mechanism activates, retracting the shield upwards to fully cover the window and protect against incoming fire. The system is designed to ensure that the attached composite layers provide complete coverage, preventing bullets from penetrating the vehicle. Once the threat is neutralized, the shield can be retracted back to its original position, restoring visibility and mobility.

DESCRIPTION



Fig.7

DYNEEMA

A UHMWPE-faced honeycomb core sandwich panel, also known as Dyneema, consists of Ultra-High-Molecular-Weight Polyethylene (UHMWPE) face sheets and an aluminum or Nomex honeycomb core, offering lightweight construction, excellent ballistic resistance, and high impact absorption.

[Properties Of Dyneema](#)

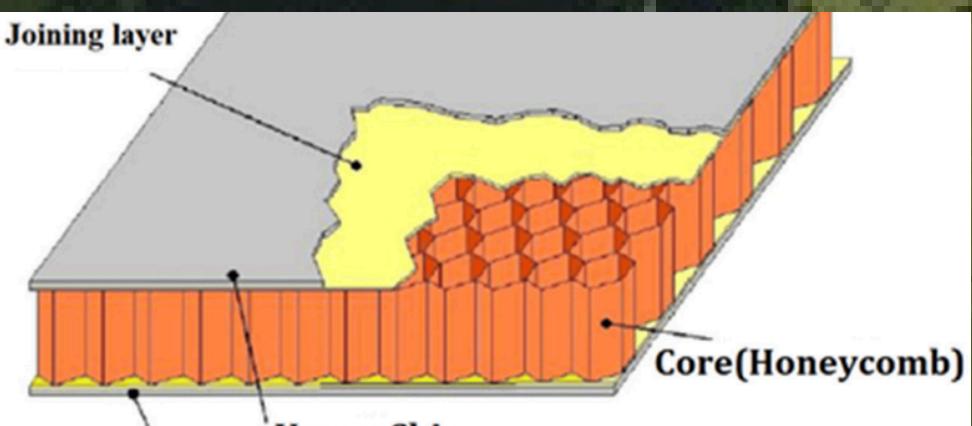


Fig.8

CERAMIC COMPOSITE MATERIAL

A ceramic-faced composite with a polymer core combines a hard, impact-resistant ceramic outer layer with a tough, energy-absorbing polymer core for enhanced protection, lightweight design, and durability.

[Properties Of Ceramic](#)

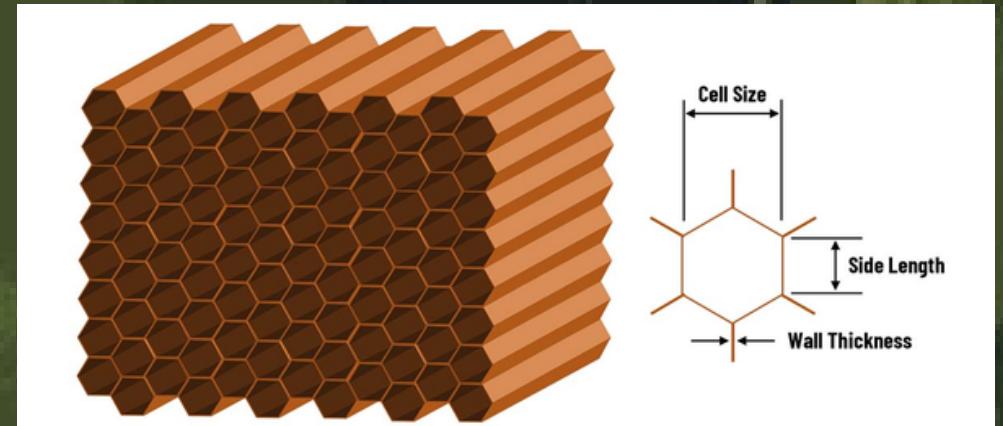


Fig.9

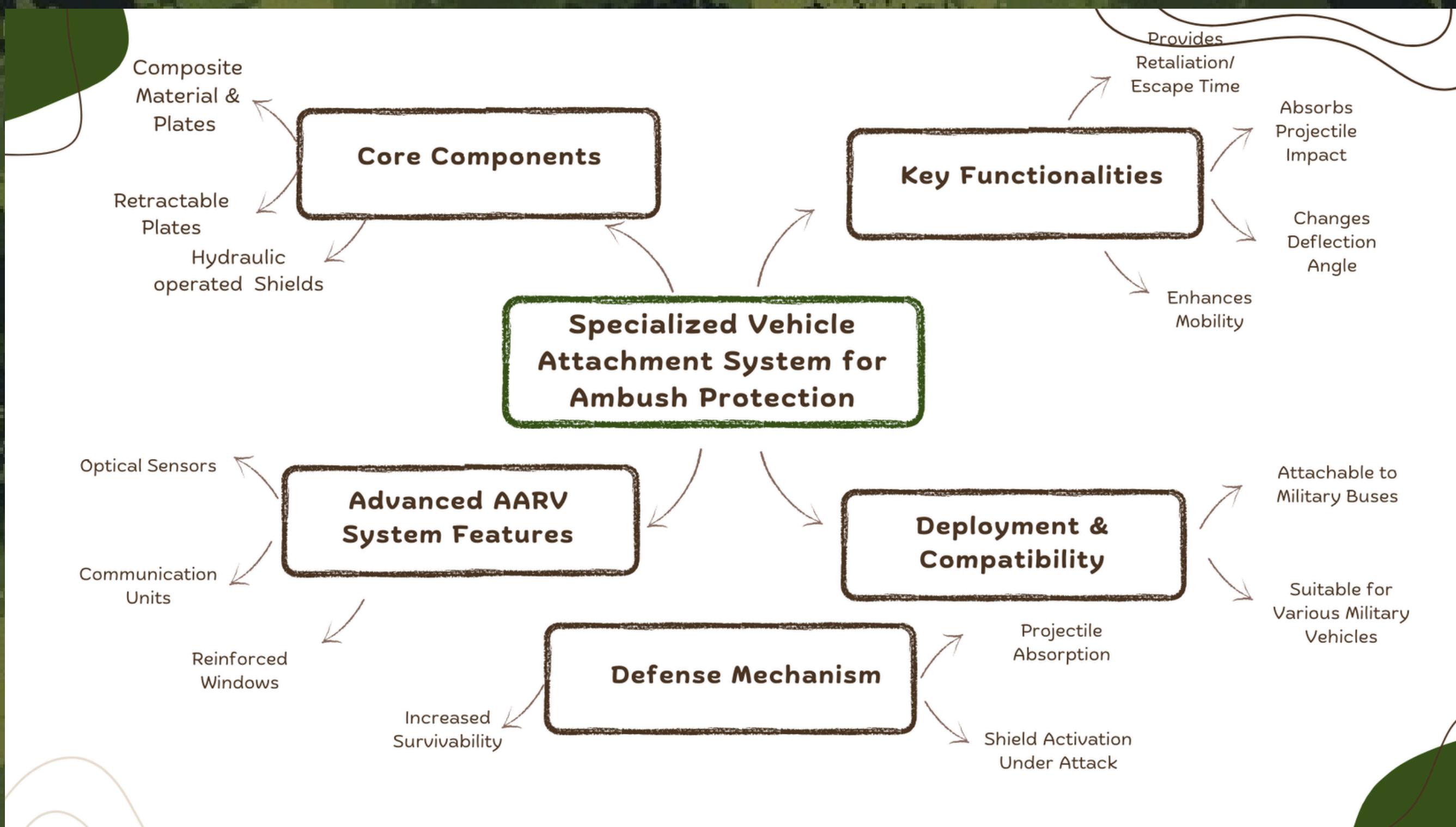
ARAMID (KEVLAR) AND ALUMINUM HONEYCOMB CORE

An aramid Kevlar and aluminum honeycomb core composite combines Kevlar's high impact resistance with an ultra-light, strong aluminum honeycomb structure for superior energy absorption, durability, and lightweight protection.

[Properties Of Aramid kevlar and aluminium](#)

RESEARCH OUTCOMES

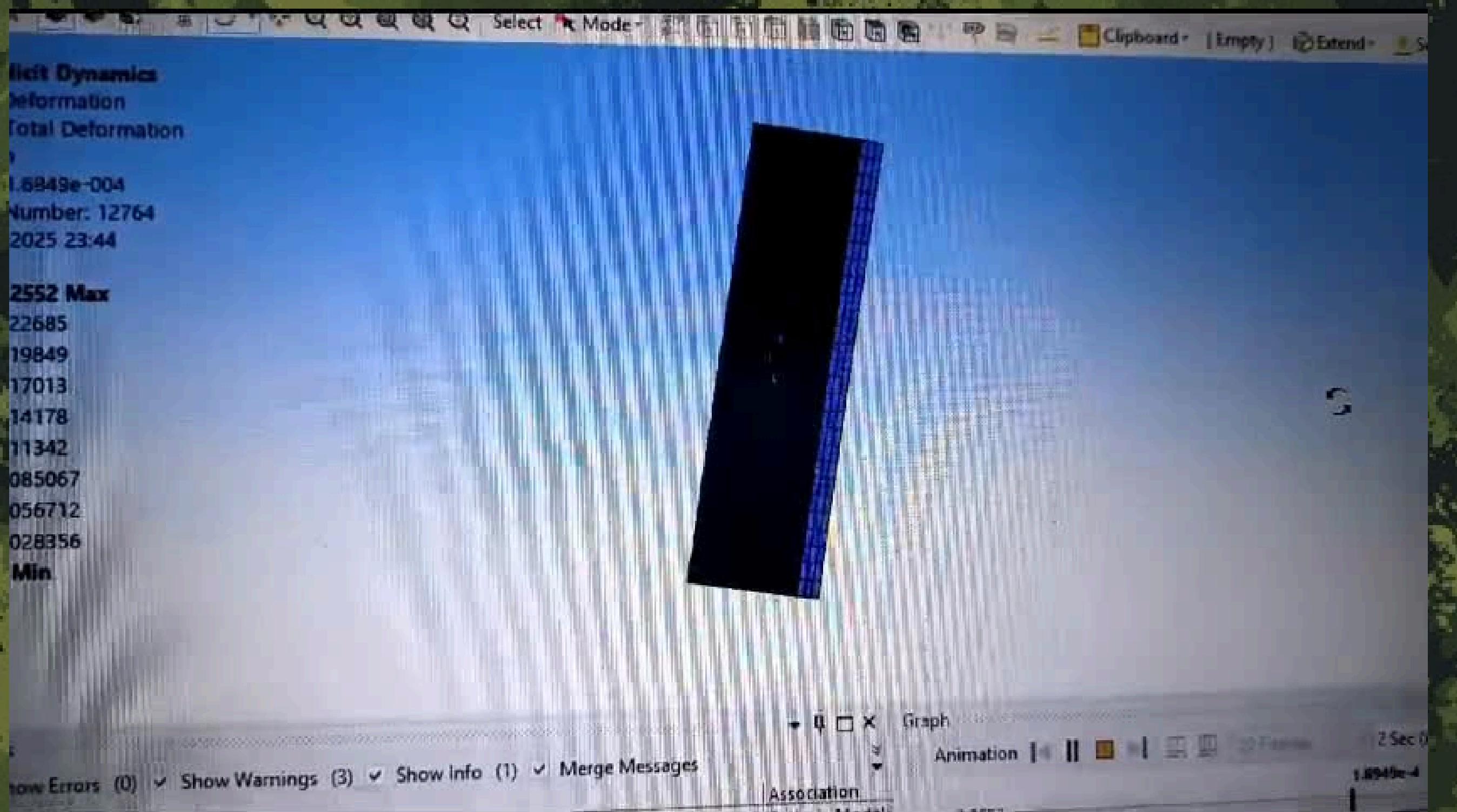
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CONCLUSION

The AARV (Anti Ambush Retaliation Vehicle) is a revolutionary solution designed to enhance safety in conflict zones by protecting security forces and civilians from sudden ambush attacks. Its advanced armored shielding system, powered by a hydraulic mechanism, provides quick and effective defense against gunfire. The multi-layered protection, including Kevlar, Rubber, Ceramic Armor, and UHMWPE, ensures maximum impact absorption, preventing bullet penetration. By integrating smart defense mechanisms and cutting-edge materials, AARV significantly improves convoy security and survival in high-risk areas. Moving forward, advancements in technology and automation will further strengthen such protective systems, making transportation through dangerous regions safer. With AARV, we take a vital step towards a more secure and protected future.

VISUAL SIMULATION



PAST ACHIEVEMENTS

Anti-Ambush Retaliation Vehicle (AARV) won the prestigious Converge 22 award by Atal Innovation Mission and NITI Aayog for its groundbreaking impact in defense technology. This recognition highlights AARV's innovative, cost-effective, and scalable solution for protecting soldiers and civilians. The award validates its potential to revolutionize battlefield safety and enhance security in high-risk zones.



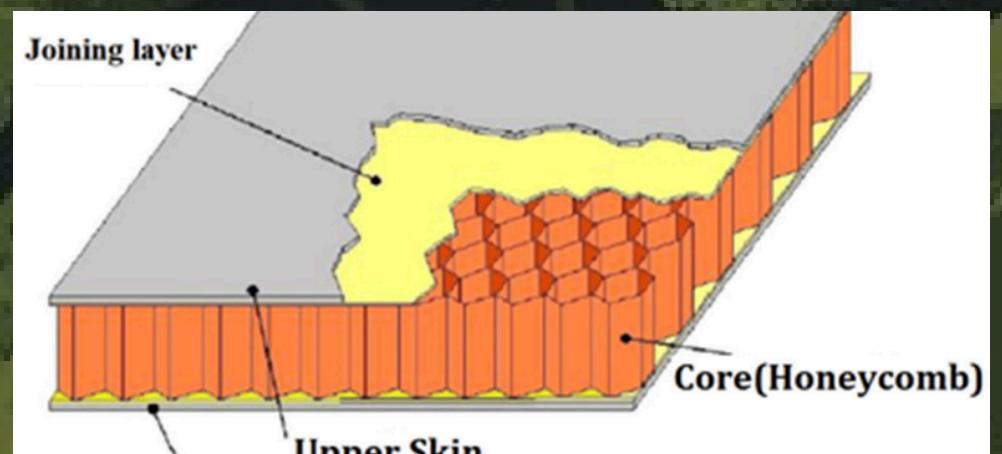
THANK YOU

COSTING

Western Global Insulation Pvt Ltd offers Dyneema® fabric suitable for applications like bulletproof jackets, priced between ₹2,500 and ₹5,000 per square meter.

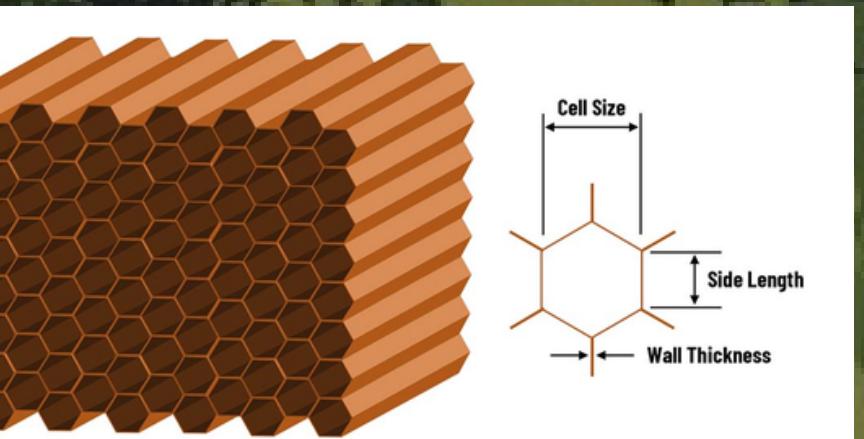


DYNEEME



CERAMIC COMPOSITE MATERIAL

HXT Aramid Honeycomb Core Sheet Panel: Available in a size of 310mm x 210mm x 12mm, this lightweight panel is priced at ₹6,829.



SpeedyFPV Aramid Honeycomb Core Sheet Panel: Measuring 310mm x 210mm x 3mm, this ultra-lightweight panel is priced at approximately ₹5,895.

ARAMID (KEVLAR) AND ALUMINUM HONEYCOMB CORE