

## **Composites in Combat: Composites for Military Vehicles**

Soldiers globally are committed to their duty of protecting the country and therefore superior technologies are essential to protect them. One such essential technology is in the development of Composite Materials. The increasing use of composites and innovations in fabrication has enabled composite components to satisfy the need for military vehicle components. Armoured vehicles have traditionally used steel armour. However, this gives rise to heavy structures that provide logistical problems in transporting the vehicles to a battle site. This major hindrance has led to a major increase in the development of composite armoured vehicles.

The advantages of using composites are enabling weight savings, high payload and fuel efficiency, high performance and speed capability. Since military vehicles are constructed with the protection factor in mind, they are bulky, however composites render them lighter. Composites have an infinite fatigue life and good corrosion resistance in challenging environments. Apart from being used in land combat vehicles, composites are also finding applications in air combat vehicles. Constant pressure for greater fuel efficiency is forcing aircraft manufacturers to find ways to incorporate new materials. Forty years ago, aluminium dominated the aircraft industry. As much as 70% of an aircraft was once made of aluminium. Other new materials such as composites and alloys were also used, including titanium, graphite, and fiberglass, but only in very small quantities – 3% to 7%.

Times have changed. A typical jet built today has, as little as, 20% pure aluminium. Most of the non-critical structural material – panelling and aesthetic interiors – now consist of even lighter-weight carbon fibre reinforced polymers (CFRPs) and honeycomb materials. Meanwhile, for engine parts and critical components, there is a simultaneous push for lower weight and higher temperature resistance for better fuel efficiency, bringing new materials into the aero material mix. Composite materials represent a growing piece of the aircraft material pie. They reduce weight and increase fuel efficiency while being easy to handle, design, shape, and repair. Once only considered for light structural pieces or cabin components, composites' aerospace application range now reaches into true functional components – wing and fuselage skins, engines, and landing gear. The mix of materials in aero industry will continue to change in

coming years with composites increasingly occupying the space of traditional materials. And it's all done in the name of reducing the cost; improving fuel economy and making air travel a more cost-effective means of transportation. Being said so much about the advancement in materials technology; it becomes essential for someone to work towards developing new composite materials for the future. In this aspect, the Department of Mechanical and Aerospace Engineering of Karunya Institute of Technology and Sciences have gone leaps and bounds to master this technology. The institution also provides consultancy and testing services for Aluminium based Composite Materials through the Centre for Research in Metallurgy.



**Composite Part in V-22 Tilt-Rotor Craft**



**Composite Break Pad in Light Combat Vehicle**