

PERMALI



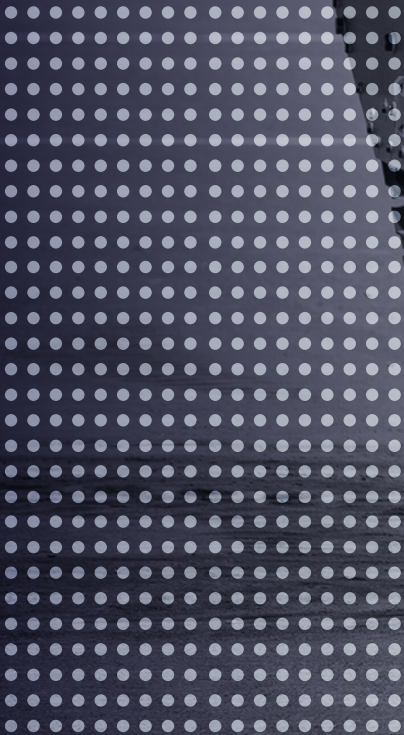
Part of the
Diamorph Group

COMPOSITE SOLUTIONS FOR DEFENCE

PROVIDING SOLUTIONS
FOR LAND, NAVAL AND AIR
DEFENCE APPLICATIONS.

Protection. Performance. Precision.

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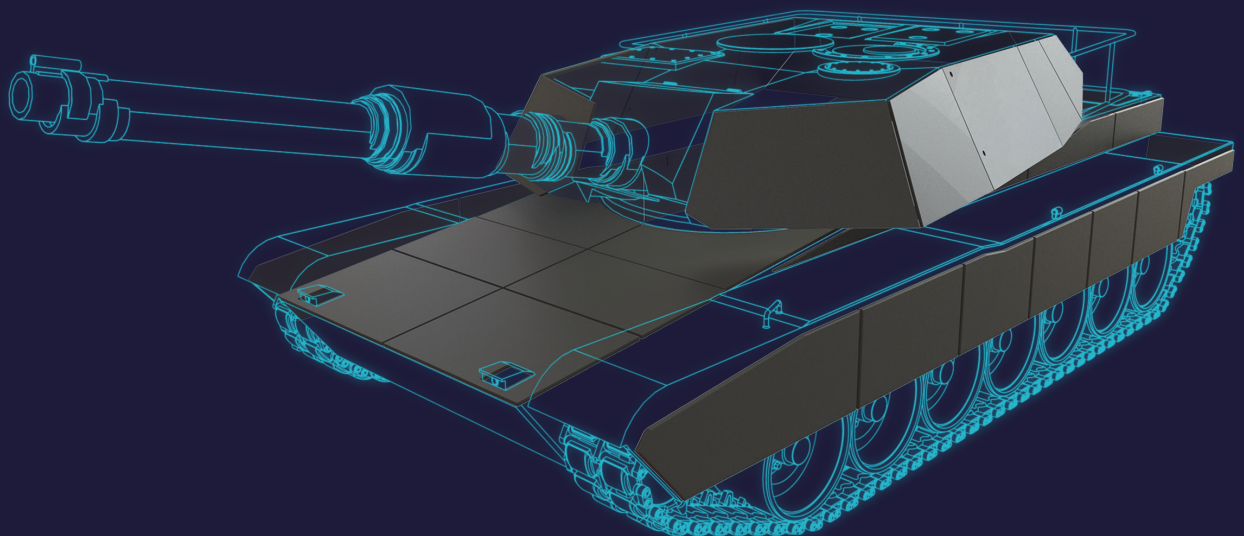
APPLIQUÉ ARMOUR

LIGHTWEIGHT ADD-ON ARMOUR FOR
ENHANCED BALLISTIC PROTECTION



Permali's appliqué armour is designed to be fitted to light or heavy military vehicles to enhance protection from ballistic threats up to STANAG Level 4. In many cases it is used on AFVs where the existing vehicle hull does not offer sufficient protection.

Permali's appliqué armour systems can be retrofitted to existing vehicles or supplied for new build vehicles at the design stage.



KEY BENEFITS



CLASS-LEADING BALLISTIC PROTECTION

Up to STANAG 4569 Level 4 - small arms up to 14.5mm (AP), artillery and IED fragments. Exceptional multi-hit protection.



IMPROVED ENVIRONMENTAL PROTECTION

Thermal and acoustic insulation. Fire retardancy. Corrosion resistance. Chemical resistance.



OPTIMISED LIGHT WEIGHTING

STANAG 4569 Level 3 7.62mm (AP) areal density as low as 54.5kg/m². Wide range of materials available to optimise cost, weight and ballistic performance (including Polyethylenes (UHMWPE), Glasses, Ceramics, Aramids, Metallics and Coatings).



FULLY VEHICLE INTEGRATED

Designed in response to platform analysis to maximise protection against the prevalent threat of recent war fighting and peacekeeping operations. Designed for easy installation and manufactured to precise tolerances.

Permali combines its ballistic grade Permaglass[®] laminate products with either ceramic or hardened metallic materials to form high performance appliqué armour solutions. Ballistic protection levels range from small arms to heavy machine guns as required. Permali's appliqué armour also offers proven resistance to shock and vibration as well as excellent ballistic performance at extreme temperatures.

Specialty prepreg fibre reinforcement and thermoplastic materials used by Permali for Permaglass[®] composite armour include:

- Ballistic grade UHMWPE fibres, including DSM Dyneema[®] and Honeywell Spectra Shield[®]
- Kevlar[®] and Twaron[®] aramid fibres
- Woven and non-woven S2 and E glass fibre fabrics
- Alumina, Silicon carbide and Boron carbide ballistic grade ceramics
- Chemical resistant Tufshield[®] elastomeric PU coating

The company has a long-established global reputation as an innovative designer and manufacturer of lightweight anti-ballistic and blast resistant advanced composite fibre reinforced (FRP) materials and fabricated appliqué armour systems.

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SPALL LINER

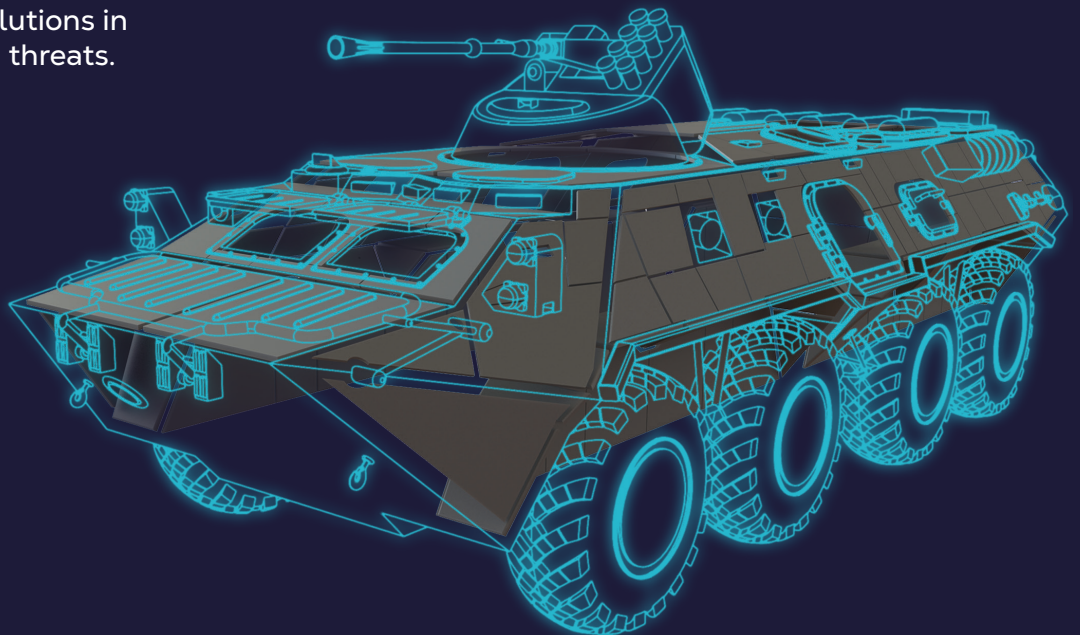
INTERNAL BALLISTIC FRAGMENT AND BLAST PROTECTION



Bespoke ballistic solutions specially designed and optimised to provide ultimate over match protection for your vehicle platform.

The function of a spall liner is to prevent metal fragmentation spalling injuries to the occupants of military armoured vehicles from land mines/IEDs or attack by an opponent with superior fire power.

Permali have provided battle proven spall lining solutions and continue to develop innovative solutions in response to emerging threats.



KEY BENEFITS



ENHANCED SURVIVABILITY

Increased protection against metal fragmentation spalling injuries to the occupants of military armoured vehicles from land mines/IEDS or attack by an opponent with superior firepower.



COST EFFECTIVENESS

Cost savings of 29% over off the shelf grades. Recent Permali innovation providing enhanced protection at a lower cost per square metre.



OPTIMISED LIGHTWEIGHTING

A range of battle proven material solutions allow for lightweight designs while maintaining highest protection levels.



EASY TO INSTALL

Carefully designed for easy installation and manufactured to precise tolerances.



ENVIRONMENTAL RESISTANCE

Optional EMI/RFI protection. NBC clean down chemical resistance. Thermal and acoustic insulation. Fire resistance.



MATERIAL OPTIONS

Polyethylenes (UHMWPE), Aramids, Glasses, Coatings.

Manufactured using advanced composite materials, Permali's Permaglass® spall lining grades are proven to significantly reduce the amount of spall debris entering an armoured vehicle, minimising serious injury to military personnel and helping to prevent fatal casualties. Permali manufactures bespoke sheet and moulded components with a range of areal densities which are specifically designed to fit the vehicle interior maximising the area of coverage providing optimal survivability.

Lightweight Permaglass® composite sandwich design panels are also produced for spall liners and armour systems with high pressure laminated UHMWPE cores.

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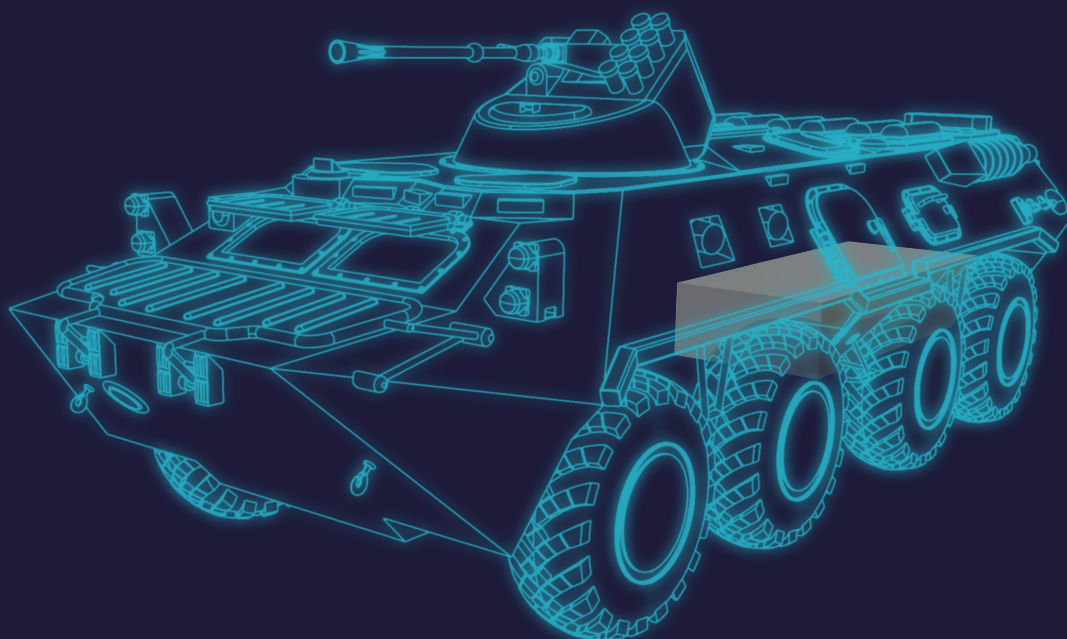
BATTLEJACKET®

PROTECTIVE COATING TECHNOLOGY FOR FUEL TANKS AND TANKERS



Ballistic damage to vehicle fuel tanks can cause catastrophic fires and explosions or immobilise vehicles due to fuel loss.

BattleJacket® is an advanced spray-on protective polymer technology that immediately seals and heals a punctured fuel tank when pierced by a bullet or projectile, preventing fuel loss and explosion, providing the ultimate protection to mission critical assets.



KEY BENEFITS



FUEL LEAK PREVENTION

Unique healing polymer technology automatically seals penetrations on impact.



EASY TO APPLY

Sprayed on like a paint and bonds strongly to all metallic and plastic surfaces. CARC paint compliant.



ENHANCED ENVIRONMENTAL RESISTANCE

Improved protection for the tank against temperature (-50°C to 150°C), corrosion, abrasion, and impact.



INCREASED STRUCTURAL INTEGRITY

High durability external coating withstanding high pressures up to 150 psi.



OIL POLLUTION PREVENTION

Title 40 Section 112 compliant.

BattleJacket® is a battle proven technology with nearly 20 years of service history in military applications. Developed for the US armed forces for the protection of land based vehicles against explosions and fires due to ballistic damage to fuel tanks and tankers, by High Impact Technology, LLC. This advanced polymer coating is a unique 3 layer spray on system that can be applied easily to complex geometries and can coat the surfaces of all fuel tank materials.

This unique, patented, fire protective urethane polymer coating has been so successful it's applications have been extended to protect other structures and products such as fuel cells, holding tanks, pipelines, railcars, with the list continuing to grow.

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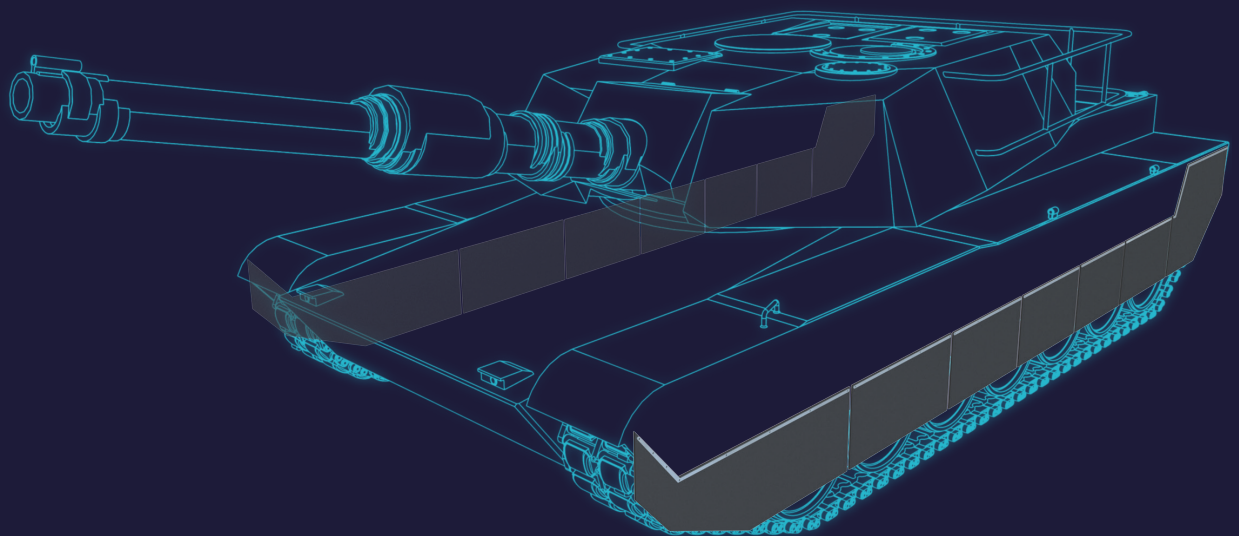
DUST SKIRTS

SIGNATURE REDUCTION
TECHNOLOGY



Dust skirts are a modular, retrofittable system, based on a new tough rubber composite material.

The addition of dust skirts will aid in the reduction of abrasive dust related engine problems, which is a major issue in hot, dry theatres of operation. Permal's dust skirts offer both radar and visual signature reductions.



KEY BENEFITS



REDUCED ENGINE SEIZURES FROM DUST INTAKE

Limiting the impact of dust related engine problems, a major issue in hot, dry environments.



REDUCED RADAR SIGNATURE FROM DUST CLOUDS

Helping support stealth of AFVs by managing the shape and size of the dust clouds.



HIGH STRENGTH AND DURABILITY

Rugged material selection to balance performance between weight, strength and flexibility.



ENVIRONMENTAL RESISTANCE

Fire resistant, EMI / RFI shielding, Ozone and UV resistant, Chemical and corrosion resistant.



EASY TO INSTALL

Tailored designs for simple vehicle integration. Fixing mechanisms quick to release and re-attach.

Permali's dust skirts are designed to provide the optimum balance between stiffness and flexibility from a synthetic fire-retardant rubber composite designed for Armoured Fighting Vehicles (AFVs). The system ensures the operational risks caused by sand and dust are mitigated; Permali's dust skirts can also be applied to wheeled AFVs.

Fitting Permali's dust skirts decreases the volume of sand and dust which is thrown into the air and potentially drawn into the engine through the air inlet. Permali's dust skirt system is provided with easy application 'bolt-on' brackets that will fit the majority of AFVs and these brackets are available in either metallic or composite material.

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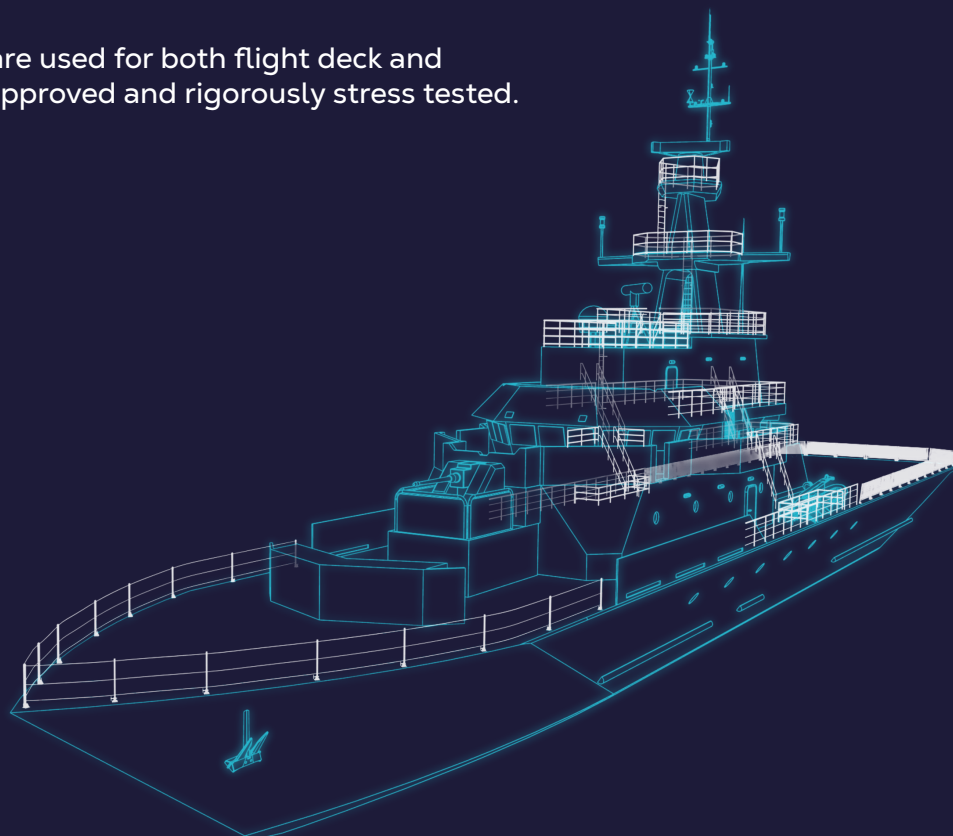
FLIGHT DECK NETS, STANCHIONS & GUARD RAILS

SAFETY SYSTEMS FOR NAVAL AND CIVIL VESSELS



Stanchion guardrails and safety net systems are designed to provide enhanced protection for crew members from falling overboard and improved safety when ascending and descending ladders and steps.

Permal's safety net systems are used for both flight deck and gun platforms and are MOD approved and rigorously stress tested.



KEY BENEFITS



HIGH STRENGTH

Optimised fibre alignment to provide maximised strength characteristics and shock resistance.



EASY TO OPERATE

Net systems can be raised and deployed by a single operator.



REDUCED RADAR SIGNATURE

Solid GRP construction designed to eliminate radar reflection.



VIBRATION FREE

Precision design minimises vibration from ship movement, reducing signature.



ENVIRONMENTAL RESISTANCE

Painted GRP construction combined with stainless steel chandlery. Corrosion resistant. Fire retardant.



LIGHT WEIGHT

High strength to weight ratio materials designed to balance performance, durability, cost and weight.



PROVEN DURABILITY

+20 years in-service operating capability.

We offer solutions for the following applications:

- RAS / Hangar lift off gates
- Safety net systems for gun platforms
- Safety net systems for flight decks
- Parafil sections
- Ladder access points
- High temperature nets
- Brow access

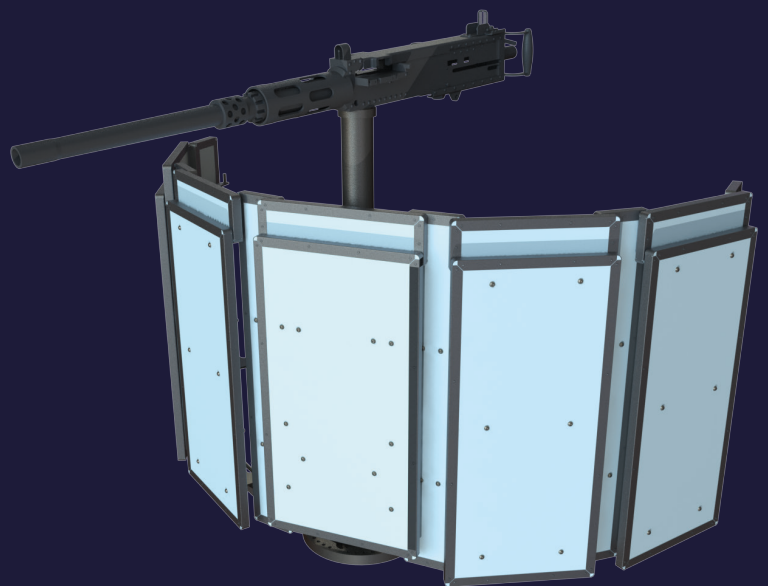
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BALLISTIC PROTECTION

BALLISTIC PROTECTION FOR UPPER DECK SMALL
AND MEDIUM CALIBRE GUN POSITIONS



Ballistic Protection panels are designed to provide enhanced protection for operators of upper deck mounted small and medium calibre weapons. Permal's Ballistic Protection material provide excellent multi-hit protection, while remaining a cost effective, lightweight solution to add to the armour of the vessel.



KEY BENEFITS



OPTIMISED LIGHT WEIGHTING

Wide range of materials available to optimise cost, weight and ballistic performance (including Polyethylenes (UHMWPE), Glasses, Ceramics, Aramids, Metallics and Coatings).



IMPROVED ENVIRONMENTAL PROTECTION

Armour panels are fully encapsulated using a Polyurea coating, offering environmental protection. Designed to reduce contribution to magnetic signature / radar cross section and minimise maintenance requirements.



CLASS LEADING BALLISTIC PROTECTION

Small arms protection up to STANAG Level 2 (7.62 x 39 API BZ) with exceptional multi hit performance.



RAPID DEPLOYMENT

Lightweight, modular, deployable system easily erected by two operators in minutes. Systems can be scaled to suit area of gun mounting position and arc of coverage.

Permali design and develop ballistic protection systems for storage areas on ships for ammunition, high explosive charges and pyrotechnics. Armour systems are designed to meet a variety of combat threats including sniper attack.

Naval vessels in service around the world fitted out with Permali ballistic protection and deck safety products include: aircraft carriers, helicopter carriers, corvettes, frigates, destroyers.

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BALLISTIC PROTECTION

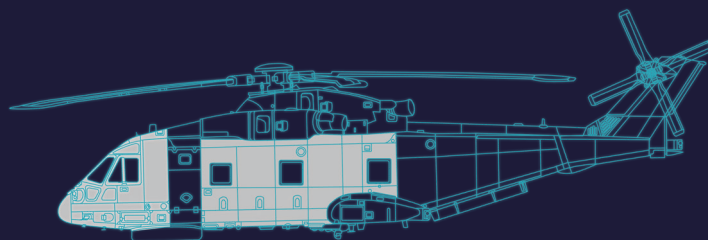
BALLISTIC PROTECTION FOR THE AIRCRAFT COCKPIT AND PASSENGER CABIN



Permal is an experienced manufacturer and supplier to the aerospace sector and recognise reducing component weight without sacrificing protection levels and other functionality is key to maximising aircraft performance. Permal have worked in close collaboration with the UK MoD, Royal Air Force, and leading rotary aircraft manufacturers to develop light weight ballistic protection to meet a range of threat levels. Permal's ballistic solutions utilise a range of materials depending on end user requirements and priorities, these materials include:

- Ultra high molecular weight polyethylene (UHMWPE)
- S and E glass
- Aramid fibres
- Ceramic technologies
- Metal technologies
- Specialist polymer adhesives, cores, and coatings
- Phenolic and epoxy resin systems

Permal's internal capabilities include design, test, prepreg, high pressure pressing, precision machining, assembly and painting. The resulting ballistic panels provides protection in all critical areas of the aircraft - floors, side walls, seats, cargo compartment, passenger cabin, and doors. Used in multiple rotary aircraft, such as Puma, Merlin, and Chinook.



KEY BENEFITS



CLASS LEADING LIGHT WEIGHT BALLISTIC PROTECTION

STANAG 4569 level 3 7.62MM (AP) areal density as low as 54.5KG/M².

Exceptional multi-hit protection.



IMPROVED ENVIRONMENTAL PROTECTION

- Thermal and acoustic insulation
- Fire retardancy
- Corrosion resistance
- Chemical resistance
- Tested to perform at extreme temperatures



FULLY VEHICLE INTEGRATED

Designed in response to platform analysis to maximise protection against the prevalent threat of recent war fighting and peacekeeping operations. Designed for easy installation and manufactured to precise tolerances. Bespoke aircraft armour solutions have been developed by Permalis for both new aircraft models and as appliqué armour to upgrade the protection level of in-service planes and helicopters. Examples of successful applications where Permalis ballistic armour has been supplied include:

- CH-47 Chinook transport helicopters for the Royal Air Force (RAF) and Royal Netherlands Air Force (RNAF).
- Royal Navy (RN) Puma helicopter fleet.
- Royal Navy AW101 Merlin combat helicopter ballistic system for RAF and RNLAf.

INNOVATION

Driving technology forward, our development work is centred around two main objectives:

Complex geometries – 3D moulded shapes to optimise protection levels and maximise cabin space.

Cost reduction – evaluation of novel materials to ensure high levels of protection are provided that offer improved value for money.

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CHINOOK CARGO HANDLING SYSTEM (CCHS®)

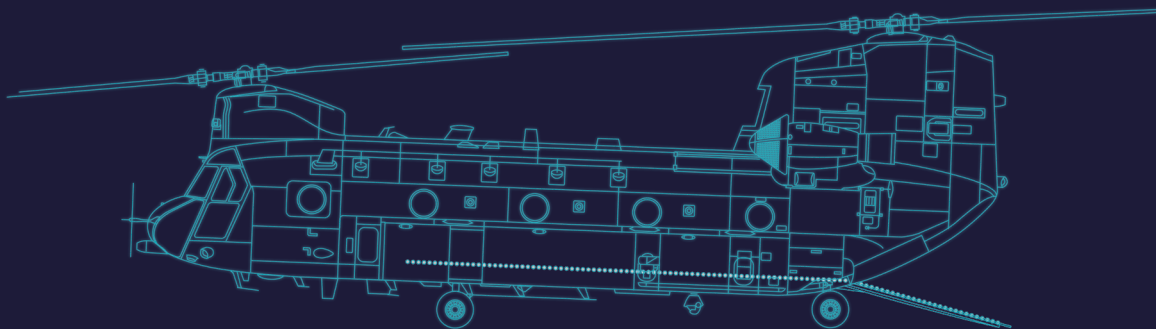
CARGO ROLLERS FOR RAPID
DESPATCH OF CARGO PALLETS



During our collaborative work with the RAF on designing ballistic protection panels for the CH-47 Chinook aircraft an opportunity emerged to create a much lighter cargo handling system for the aircraft.

The new CCHS system designed by Permalı became an instant success story with RAF Chinook crews due to its simplicity and reliability. Installed and removed by a two-man crew in only a couple of minutes, the CCHS system allows crews to quickly despatch pallets at forward bases while the aircraft remains rolling or even airborne making the aircraft and aircraft personnel less vulnerable to enemy fire.

The CCHS system proved so popular it has subsequently been purchased by the US Army and Canadian Air Forces as it provides an unrivalled capability on the battlefield and during disaster relief operations.



KEY BENEFITS



BESPOKE DESIGN BY PERMALI FOR CH-47 CHINOOK AIRCRAFT

Off the shelf solution for Chinook Aircraft, with minor modifications the same system can be configured for other aircraft.



EASY TO INSTALL AND MAINTAIN IN THEATRE

2 crew members can install or remove the CCHS system in minutes while being sympathetically designed for easy maintenance using simple componentry and tooling.



LIGHT WEIGHT

Maximising aircraft payload and allowing for simple, fast installation and removal.



LOW FRICTION CARGO ROLLERS

Easy, rapid, safe despatch of cargo pallets.



INSTALLABLE WITH OR WITHOUT BALLISTIC PROTECTION

Compliments the multi role functionality of the Chinook aircraft.

NOTES

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STARTING A NEW PROJECT? LET'S TALK.



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