



MILITARY SYSTEMS & Technology

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The Defence Suppliers Directory Magazine

DVD2022

UTAC Millbrook, 21 – 22 September

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**DVD 2022
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KEWELL CONVERTERS
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OXLEY
PLASTPACKDEFENCE
SURVIVAL SYSTEMS LIMITED
TSS INTERNATIONAL
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We welcome you to the third edition of The Military Systems & Technology Magazine 2022, and as we head into September DVD2022, at UATC Millbrook, is almost here!

As an established web portal for the International Defence & Aerospace Industry, we strive to provide a comprehensive and detailed listing of Military Equipment Suppliers, Products and Services. This magazine is designed to keep you up-to-date with latest news and events within the Defence Industry's Governing Bodies, Organisations and Companies.

A Multi-Media Portal for the International Defence & Aerospace Industry

For more information, technical guidance or the latest subscription packages available for Military Systems, please contact us where one of our team will be more than happy to advise you.

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Plus...

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GREENRAY
HMG PAINTS
TRIFIBRE
EOS
OHB DIGITAL
OXLEY
SURVIVAL SYSTEMS LIMITED
TYRON RUNFLAT
PELI BIOTHERMAL
... & much more



MILITARY & DEFENCE FOAM PACKAGING

Thinking outside the box to meet defence requirements

Military foam packaging demands a much greater attention to detail than commercial packaging solutions. A large amount of military cargo requires careful packaging and handling due to the sensitive materials. The equipment must be protected from physical impacts, climate changes and any biochemical hazards too. Military equipment is often transported around the world, which is why the defence foam packaging needs to be of the highest quality to ensure safe transportation.

Kewell Converters take into account the likelihood of physical impact and others factors in the transportation of sensitive goods. That's why our military foam packaging is produced to the highest possible standard and we take all of these things into consideration. Our expert team has a great deal of experience in producing military foam packaging for all kinds of purposes.

OUR MANUFACTURING PROCESS

We understand the needs for high-quality military foam packaging and manufacture products for this purpose. Kewell Converters Ltd. manufactures foams that meet or exceed the following military requirements:

- *Foam for general purpose packaging.*
- *High density foam for general purpose packaging.*
- *Foam for explosive compatible packaging*

Fill out our online form for a quote on your defence, aviation or industrial packaging requirements. You can also order free samples from us.

MILITARY FOAM APPLICATIONS

We supply high performance protection for applications such as helmet inserts or aircraft ejector seats. In addition to which we supply packaging, case inserts and bespoke foam parts for applications such as ordinance packing & protection, weapons carriage and bespoke designed flight cases and inserts machined to fine tolerance when accuracy is critical. Our engineered military foam is perfect for these applications as it has a number of properties that make it the ideal material. This includes the low mass, energy absorption, durability, strength under compression and tension that engineered foam packaging offers.

Static dissipative and conductive foams also find many applications in the military sector.



MILITARY GRADE FOAMS FOR PROTECTION, PERFORMANCE AND DURABILITY

Advantages

- *Tested and approved*
- *Light weight*
- *Energy absorbent*
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- *Low odour*
- *Explosives compatible*
- *Static dissipative and conductive*
- *High impact resistance*
- *High tear strength*
- *High tensile strength*
- *High resistance to compression set*

At a glance

STANDARD	DESCRIPTION	MOD GRADE	PRODUCT
DStan 81-116/3 Type GP	"Expanded polyethylene sheet - general purpose"	Grade A Grade B Grade C	Plastazote LD24 Plastazote LD33 Plastazote LD45
DStan 81-116/3 Type QX	"Expanded polyethylene sheet - explosives compatible"	Grade A Grade B Grade C	Plastazote LD24 Plastazote LD33 Plastazote LD45
DStan 81-124/2 Type QX	"Expanded polyethylene sheet and mouldings, explosives compatible"		Plastazote LD33
DStan 93-101	"Expanded polyethylene sheet, high density, for general purpose"		Plastazote PK80
DStan 81-125/3	"Electrostatic conductive foam sheet"		Plastazote LD50CN
DStan 93-117	"Static dissipative low density. Polyethylene foam"		Plastazote LD40SD
DStan 81-119/3	"Cross-linked expanded ethylene-vinyl acetate sheets and mouldings"		Evazote EV50 Evazote VA25



For 'mission critical' packaging

- *Ordnance protection*
- *Missile cradles*
- *Weapons case inserts*
- *Rifle case inserts*
- *Ruggedised case inserts*
- *Electronics device protection*
- *Flight case fitments*

For high performance protection

- *Personnel protection*
- *Body armour*
- *Helmet inserts*
- *Aircraft ejection seats*
- *Tool control inserts*
- *Sleeping mats*
- *Buoyancy devices*
- *Punctureproof' marine fenders*

For the very best defence foam packaging then speak to us about the right foam application for your military foam packaging or aviation requirement. Our defence foam packaging is made out of the highest quality closed cell foam materials. Major international aviation and defence OEM's trust Kewell to deliver and you can too. So, when failure is just not an option Kewell Converters are here to help!



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We've been manufacturing and supplying flight cases, storage and transport solutions for over 40 years, and we're proud to have worked with some of the biggest names in their industry as their trusted case supplier.

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We excel in rotational moulding assembly and pride ourselves on our quality customer service. Trifibre is proud to be an OEM (Original Equipment Manufacturer) lead by experts in their field.

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-  4.5M OVEN
-  HIGH CAPACITY LOAD
-  MULTIPLE COOLING OPTIONS

ROTATIONAL MOULDED PRODUCTS:



 EXHIBITION 
CASES



 MEDICAL 
STORAGE BOXES



 TRIFIBRE PLANTER POTS 

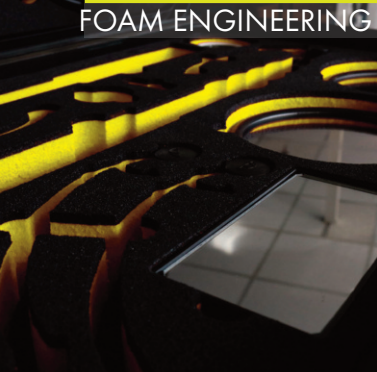
ROTATIONAL MOULDING
SERVICES



IP67 RATED CASES



FOAM ENGINEERING



BESPOKE FLIGHT
CASES



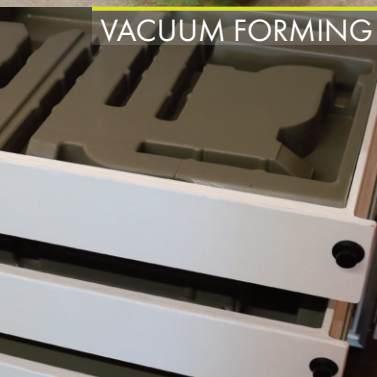
FABRICATED
PLASTIC CASES



PADDED BAGS &
COVERS



VACUUM FORMING



SCREEN PRINTING
& BRANDING



UK'S LEADING

CASING MANUFACTURER & SUPPLIER

Trifibre is the UK's leading case manufacturer and supplier with a vast array of products offered on a global scale. Established in 1981, the company has over 40 years of experience. During this time, we have developed and progressed into a highly respected and innovative casing solution provider that caters to many industry sectors, including: Aerospace, Medical, Defence, Scientific, Music, and more...

Based in the heart of England, our 70,000 sq ft premises has the facility to produce large order volumes using a wide range of manufacturing techniques and the latest design software packages. Trifibre is able to produce the highest quality products consistently with short lead times at very competitive prices.

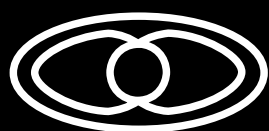
" We are proud of all the work we do, be it large corporate supply, or a simple box for personal storage. Our decades of experience means we're best at what we do. "



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OF MAX CASES IN THE UK

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CHALLENGER AND MANY MORE...





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Tact

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HF SDR
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**4049 Auto
tuning
Mobile HF
Antenna**



**PRC-4091
HF SDR
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Mobile**



**4045 HF
Antenna
Tuner**



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HF SDR
Tactical
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Station**



Since 1976, Barrett Communications have been a specialist designer and manufacturer of tactical and commercial HF and VHF radio communications systems to military, security, government and peacekeeping organisations globally.

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SKYDEX SHOCK MITIGATION PRODUCTS:

ARMOUR ENHANCEMENT



As part of its mission to deliver high-quality mobility products for armoured vehicles under the harshest of circumstances, TSS International BV has recently seen an increase in deliveries of SKYDEX Original Threat floor mats, protecting occupants of armoured vehicles against the damaging after-effects of an under-vehicle IED detonation. The Toyota Land Cruiser 200 continues to be a popular civilian platform to make use of the extremely light-weight and effective shock mitigation products.

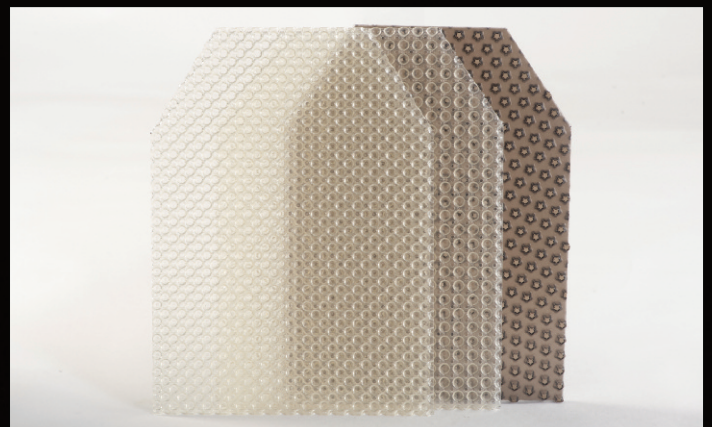
When an armoured vehicle is struck by an under vehicle explosion, a series of events is initiated. First of all, the steel floor protects the occupants from the shrapnel resulting from the blast. As a consequence, the floor moves upward at extreme speeds, transferring a large portion of the explosive force into the feet and lower legs of the passengers. The energy and speeds are so immense, that the human body has no time to react to them, resulting in severe injuries. In many cases, the force of the blast elevates the vehicle from the ground surface. The vehicle quickly lands back on the ground, which slams the occupants back onto the same floor that just so recently caused the incapacitating injuries.

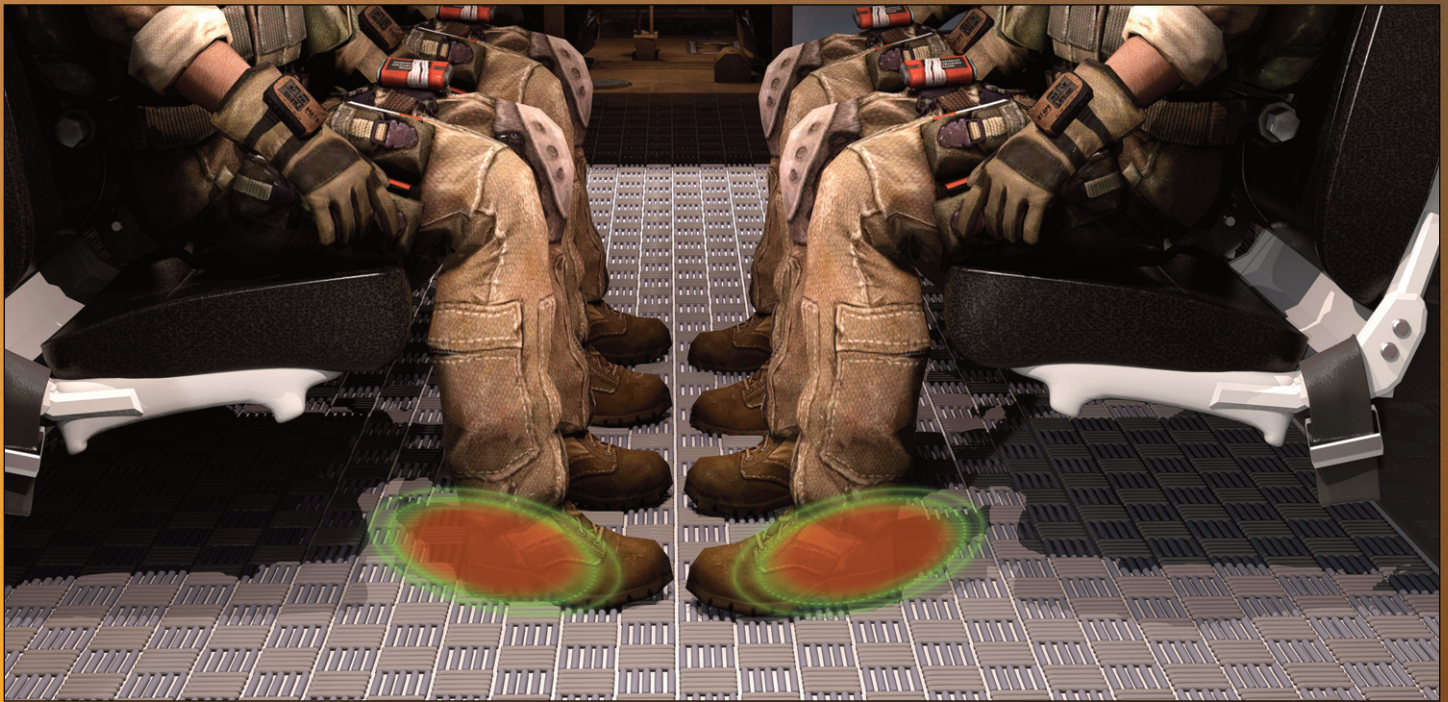
SKYDEX shock mitigating mats for armoured vehicles contribute to the safety of the passengers and crew by compressing upon impact and absorbing a large portion of the kinetic energy. Up to 90% of this destructive force can be reduced, as has been observed in more than 25.000 in-theatre vehicles, countless laboratory tests and validations, as well as multiple IMPETUS simulations. TSS has even helped clients pass certification tests according to STANAG Explosion Resistant Vehicle (ERV) Level AEP-55 volume 1 and 2 tests, by quickly supplying the right type of material for the requirements.

SKYDEX shock mitigating floor mats are available in different configurations and thicknesses, to meet different levels of threat. As SKYDEX' official European Distributor, TSS International is at your disposal to deliver results.

In addition to protection in armoured vehicles, TSS now also offers personal protection, by means of trauma protection plates for use in body armour and ballistic helmets.

The trauma protection for body armour consists of extremely thin and lightweight panels that absorb the kinetic energy of a direct





projectile hit on body armour, reducing the likeliness of for example rib cage injury or internal bleeding. Positioned between the armour and the upper body, it acts as a buffer to help protect the user against injury, whereas the vest protects the user against the ballistic threat.

SKYDEX trauma protection for body armour:

- **Lightweight;**
- **Up to 3.5mm thin;**
- **Back Face Signature (BFS) reduction of up to 60%!**
- **Multi-impact resistant;**
- **Hygienic and easy to clean;**

Similar protection is also available for ballistic helmets. The impact of a bullet on a ballistic helmet can cause concussion or even brain injury. SKYDEX has developed an easily fitted set of energy absorbing pads, protecting the head from impact of the helmet after a ballistic hit and combined it with the best fitting helmet adjustment product in the market to make SKYDEX IsoFit Helmet Protection System!

Specifically for special forces, using equipment like night vision goggles, IsoFit makes helmets better, by offering a one-handed, dial-adjustable custom fit. Instead of clamping on the front and back of the head, comfortable and stable fit is achieved by a three-dimensional, 360° adjustability.

SKYDEX IsoFit Helmet Protection System: join the future of helmet protection.

- **Unparalleled and combat proven helmet protection**
- **Hygienic and easily-cleaned inserts**
- **Multi-impact protection**
- **Unmatched fit and stability, even with helmet equipment installed**
- **1-hand adjustment: 3D fit.**



Of course, TSS International will continue to provide high-quality mobility products for armoured vehicles, such as the Toyota Land Cruisers 200 and 300, MB G-Class, Nissan Patrol Y62. For flat tyre mobility, improved braking power and vehicle handling, self-sealing fuel tanks and discretely installed vehicle intercoms, turn to TSS!

For more information and more products, please

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- email us at **sales@tssh.com** or
- phone us via **+31 180 618 922**.



WHEN THE FIRST SHOT MATTERS

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autonomous and
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DIRECTED ENERGY



R150



R400



R800

End to end CUAS solutions, from detection and tracking through to hard and soft kill effectors

REMOTE LETHALITY SOLUTIONS



Light, medium and heavy-weight UGV lethality solutions



Containerisation



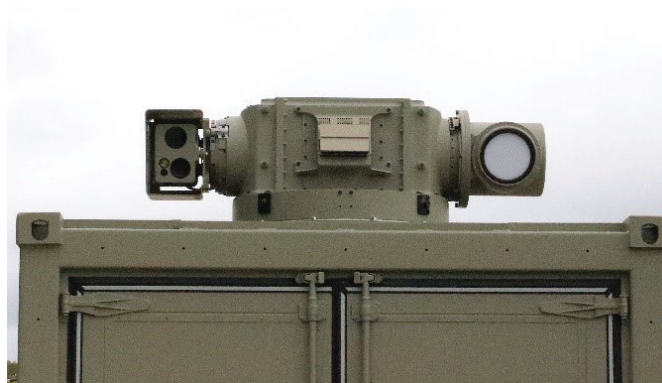
Proven lethality. Production ready.

FIND OUT MORE: [EOS-AUS.COM/DEFENCE](https://eos-aus.com/defence)





Suicide drone swarms present an asymmetric threat



Titanis 35 kW Directed Energy beam director on containerised system

TITANIS DRONE DEFEAT

Countering the threat caused by drones is now a global issue and an increasing concern for military, government and homeland security forces across every continent. It is expected that unmanned aerial systems (UAS) will be increasingly used for malicious purposes, given their ability to carry cameras, weapons, toxic chemicals and explosives, and they are already being used for acts of terrorism, espionage and smuggling.

EOS has developed the Titanis Counter UAS (CUAS) system to address the growing threat from malicious and threatening UAS.

Based on the EOS R-Series RWS, Titanis is a fully integrated, scalable CUAS suite that combines the specific detection, command and control (C2), and layered hard and soft kill defeat capabilities necessary to acquire, track and defeat swarming UAS threats.

The Titanis system allows operators to match kill solutions to large numbers and varying combinations of small and large drones to ensure that the threat can be mitigated regardless of their direction, numbers and capabilities while managing environmental, geographic, airspace and personnel safety considerations.

A typical all-up Titanis configuration incorporates direct-fire engagement systems, passive and active soft kill electronic warfare (EW) systems, an integrated sensor suite – including Pulse-Doppler, software-defined radar, day/thermal camera, laser rangefinder and radio frequency (RF) detection systems – and an optional Directed Energy (DE) kill system. These systems sit together with, and are integrated through, a proprietary, EOS-developed C2 and fire control system.

High-volume fire point defence solutions range from the 7.62 mm Dillon Aero M134-

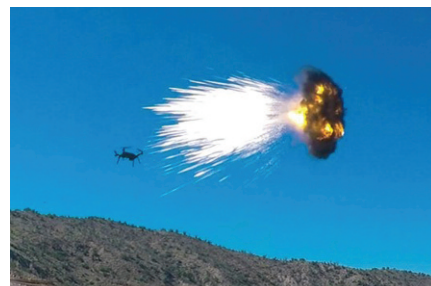
series minigun to larger-calibre 30 mm guns (e.g. the Northrop Grumman M230LF 30 mm cannon with EOS R400S Mk2 RWS, or the Mk44 II Bushmaster chain gun with the heavier-weight EOS R800 RWS) firing airburst munitions (including 30 mm × 113 mm proximity fused airbursts and 30 mm × 173 mm airburst rounds) to deliver CUAS effects out to 3000 m.

One of the key differences between CUAS and other missions is the high angular speed that UAS can achieve at relatively short range. EOS RWS have been modified with a fourth-axis, independently slewing sensor unit that can move independently in azimuth to track fast-moving targets. A 1 Hz laser provides laser ranging and tracking throughout the engagement.

Passive and active soft kill EW systems designed to operate across all-threat frequency bands are, as with the radar solutions, integrated according to customer preference. Typical solutions include offerings from Blighter in the UK, Echodyne in the US and RADA in Israel.

Titanis' DE system has been deployed with a 35 kW high energy laser (HEL), although the HEL in its current format is capable of scaling to around 55 kW. The HEL system has been demonstrated as a small containerised system; however, while the DE beam director is slightly different to a weapons station, it has 60% commonality with the R400S RWS and is therefore effective from deployable platforms.

Developed and manufactured in-house by EOS, the DE system – which includes the beam director and the co-mounted optical target identification and tracking system – is designed to address Group I, II and III UAS swarm threats, with high rates of target engagement, out to ranges of 4000 m.



Kinetic CUAS using airburst munition



RWS fitted with Dillon Aero M134-Series minigun

The ability to maintain and manage the quality of the beam, the software that ensures precision engagement and drives the process, and all the mechanical designs and architectures are all EOS designs and intellectual property.

Arguably, the largest current growth rate in lightweight lethality systems is in the unmanned systems space, both for integration on unmanned platforms with remote operation and for the engagement and defeat of unmanned systems. For CUAS applications, Titanis – with its direct engagement/point defence, and passive and active EW and DE capabilities – constitutes a significant force multiplier.



FIND OUT MORE: [EOS-AUS.COM/DEFENCE](https://eos-aus.com/defence)

HOW PELI HELPS MILITARY & DEFENSE FORCES: 19-INCH RACKS

THE ROLE OF IT AND MILITARY



In the information age, modern military operations are more complex and varied than ever. Consequently, in addition to combat, the military is increasingly focused on Information Technology (IT). Military intelligence, military operation plans, military personnel and supply transportation logistics are just some of the areas in which IT plays a crucial role in modern military strategy. Additionally, due to the increasing role that IT plays in the military, data security, encryption and hacking protection pose major challenges for contemporary defence and armed forces.

As is evident from the above, IT equipment is imperative to military strategy, whether that is on friendly territory or behind enemy lines. Sensitive IT equipment required by the military demands a high level of protection and its transportation to operational areas and combat zones is paramount to operational success.

State-of-the-art equipment such as servers for radio and telecommunications technology, control systems and systems for monitoring and reconnaissance are transported to military operation areas around the globe for on-site operation. During transportation, IT systems must be protected from inclement weather conditions which can cause dust, sand, and moisture, among other things, to ruin IT equipment. Given that transport is also onerous physically, this same equipment must be protected from potential vibrations and shocks.

19-INCH RACKS FOR MOBILE MILITARY APPLICATIONS

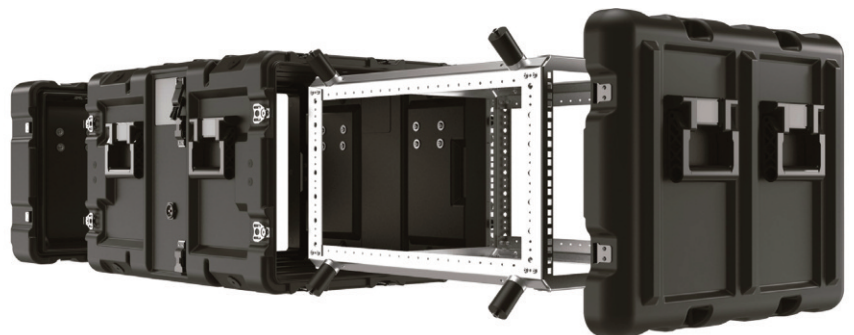
WHAT IS A RACK CASE?

The ideal transport solution to protect IT equipment is a portable 19-inch rack case. A 19-inch rack is a standardized frame or enclosure for mounting multiple electronic equipment modules. Each module has a front panel that is 19 inches (482.6 mm) wide. The 19-inch dimension includes the edges or "ears" that protrude from each side of the equipment, allowing the module to be fastened to the rack frame with screws.

One of the many advantages of portable rack cases for military IT specialists is that they are able to connect and configure all systems to one unit housed in the case, so that only a few cables have to be connected on site. This plug-and-play system allows for the quick deployment of the IT equipment on site, providing valuable time savings to military personnel.

For military bodies, rack cases must adhere to strict specification requirements.

- Rack cases must house a sturdy 19" frame inside to mount sensitive electronics.
- They must have a certain lid depth to accommodate the connectors and cables.
- They must be able to be used for various IT applications.
- During transport, the case must not allow any shocks and vibrations to occur to the sensitive equipment housed in the case and must also ensure effective protection against external elements



such as moisture and dust.

- Rack cases must be easily handled and transported. Most will be equipped with fixed wheels, also known as caster wheels, while many are stackable. This is indispensable in order to be able to quickly deploy the IT equipment and guarantee its operation.

"Peli Products acquired Hardigg Industries back in 2008, an organisation that had been working on the topic of technical transport packaging for over 60 years, and we are well aware of the strict requirements of the military when it comes to protecting their sensitive IT equipment. Often it is the small details that you have to keep in mind," says Stefan Wolf, Peli Products Director of Sales for Western Europe. "Many devices are of varying degrees of sensitivity to external influences, which means much attention must be paid to the exact specifications of the user's IT equipment that is to be mounted in each case."

PELI RACK CASES

Peli Products is a manufacturer of 19-inch high-impact polyethylene rack cases with built-in frames for the mounting of electronic devices of all kinds. Shock mounts made of elastic plastic or other protective materials are incorporated into the cases to provide a buffer zone between the inner 19-inch frame and the walls of case. This isolates the devices housed inside the cases and allows for the absorption of shocks and vibrations without harming the devices.

The Peli Products Rackmount Case can either be custom configured according to a user's exact requirements or a user can choose from a wide selection of preconfigured "off-the-shelf" standard rack case models. With a total of eight rack case types and an extensive range of different rack heights and depths as well as unlimited customization possibilities, there is a case for everyone.

Peli 30-inch depth Rack Cases



Peli has recently launched its new set of 30-inch-deep rack frame cases. These rack cases are ideal for a wide range of solid-state servers between 27-inches to 29-inches in length. Larger servers allow for more storage capacity as well as more efficient cooling capabilities,

which reduces performance issues associated with overheating.

Although the use larger servers can be advantageous to military IT personnel, they necessitate a rack case with a greater depth. In addition to accommodating servers of greater lengths, the 30 inches of depth allows for space for one or more pieces of equipment to be mounted on the same rack level, potentially saving space and reducing payloads. The greater depth also leaves more room for switches, connectors, and cables, which can be accessed from the back of the case due to the 30-inch rack's dual lid design, aiding in the quick and efficient deployment of IT equipment.

All of Peli's new rack cases pass MIL-810 testing, including standard 26 drops per case per payload weight range, stacking weight, vibration testing as well as a complete range of standard MIL-810, which is a hallmark of Peli cases.

Wolf continues, "The most important aspects to consider for an initial selection of the right rack is the height, length, and weight of the devices to be housed in the case. This will determine which is the appropriate case size. Next, the so-called G Fragility rating of the system components must be considered."

G-FRAGILITY RATING – WHAT IS IT?

The Fragility Rating indicates how well an electronic device is protected against impacts. The fragility of an item is normally expressed in "G" units, which are measure of the force exerted on bodies by the earth's gravitational pull. Products with a larger g-force rating require less protection from shock and vibration. For instance, an item with 20 G fragility will suffer damage when subjected to a force 20 times that of earth's gravity. The fragility of an instrument or piece of equipment is usually determined by laboratory testing and in many cases the manufacturer of the equipment to be housed in the case will indicate the G Fragility Rating.

RACK UNIT – WHAT IS IT?

Peli 19-inch rack cases are not only designed for different levels of fragility, but they must also be adapted to the exact needs of the user, which starts with the height.

"With a high level of customisation, Peli can accommodate IT equipment of almost all height requirements from 3 to 27 rack units."

A rack unit, abbreviated as U and sometimes RU, is the standard unit of measurement applied to rackmounts and the servers, disk drives and other devices that they contain. A rack unit corresponds to a height of 1.75 inches or 44.45 millimetres.

Peli's new 30-inch depth rack cases are currently available for 3U, 5U, 7U and 9U sizes.

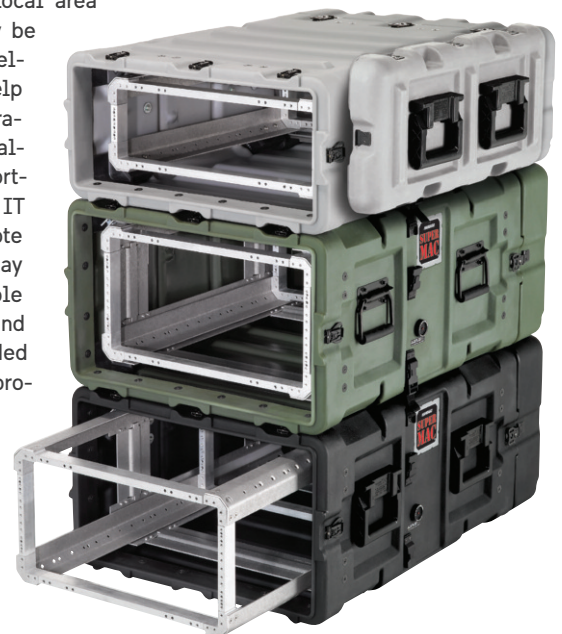
RACK DEPTH, WEIGHT AND OTHER MADE TO ORDER OPTIONS

The rack depth and weight of the equipment to be housed in the case must also be taken into account, but Peli cases are fully configurable and can be made to order.

"For example, there are multiple rack depths, removable or fixed caster wheels, slide-out 19" frames and drawers, and pockets in the lid for storing cables, and much more. Peli's engineering team takes into account the smallest details. For instance, the choice of the case colour is important because it can affect the internal temperature. Other details such as the possibility to attach the lids to the side of the case during operation or the inclusion of small rollers in the lids for easy handling allow us to find a perfect solution for every user," concludes Wolf.

EVOLVE: MILITARY & IT

As technology evolves, the requirements for the armed forces will continue to evolve with it in the coming years. This will mean increasingly complex tasks and operations; however, at the same time it will provide the military with more flexibility. Decentralised IT solutions with mobile operating centres and local area networks can only be offered and developed with the help of mobile IT infrastructure. The challenge of transporting and moving IT equipment to remote areas should play a significant role in this respect and should be included in the planning process during the construction of the entire IT infrastructure. Peli Products can help in this regard.



VEHICLE LIGHTING

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World leaders in LED lighting and night vision solutions

Specialists in the development of new technology for vehicle and shelter applications

Best in class all weather performance in extreme conditions

Meeting the needs of your next generation fully digitised and integrated armoured fighting platforms



Compact LED Searchlight

Searchlights

Our LED searchlight range incorporates a high intensity and a compact version, both are specifically designed for harsh environments with excellent resistance to shock and vibration and both offer low power consumption and a long MTBF. The compact light has an adjustable angle and is available with a range of light distribution and beam intensity options, all meeting tough military standards. The high intensity light is fitted with handles and a clamping system to allow 360 degree rotation, it can be mounted on a tripod and is suitable for use on or off a vehicle.



Gooseneck

Gooseneck

The Gooseneck light incorporates state-of-the-art LED technology to provide a task light designed to meet the toughest military standards. High vibration and shock proof, the Gooseneck comes with a secondary colour option, a straight or angled beam and NVIS compatibility if required.

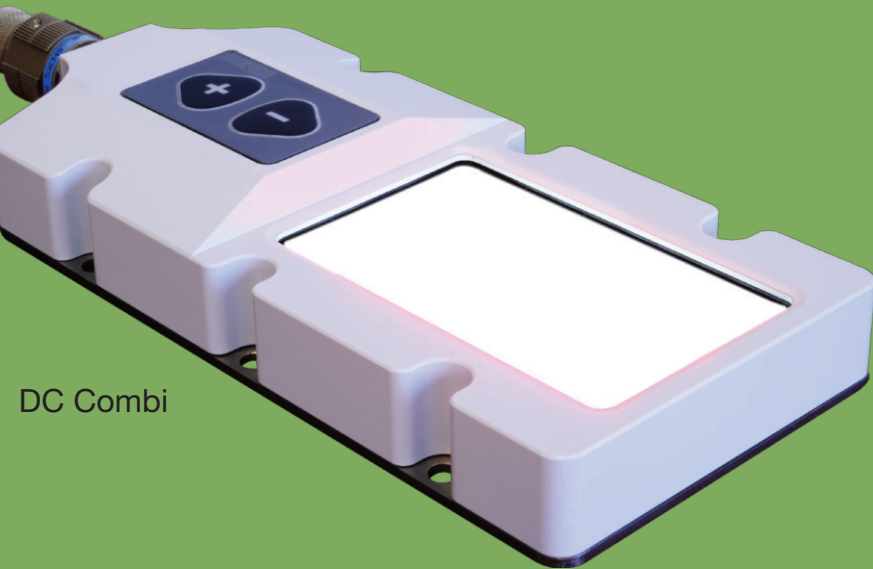
FULLY COMPLIANT TO EXCEED THE LATEST CRITICAL MILITARY STANDARDS

EMC DEF-STAN 59-411 Land Class A / MIL-STD 461

Power Protection DEF-STAN 61-5 Part 6 issue 5 and 6 / MIL-STD 1275



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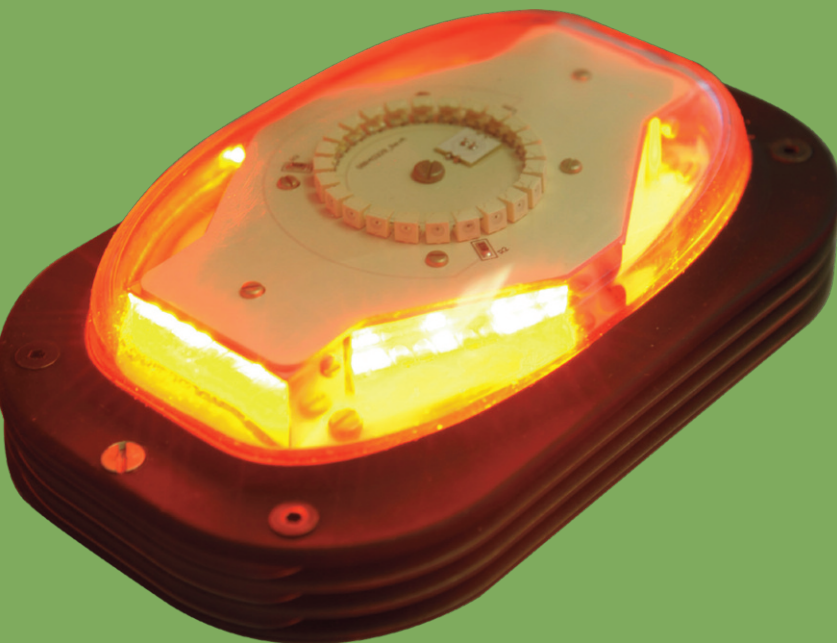
DC Combi

Combi lights

Incorporating three lights in one unit, combi lights have main, blackout and emergency modes. Available with universal input for operation in both AC and DC modes in the same unit, they can be installed in any land platform with customised variations to suit specific requirements.

These lights have many advantages compared to traditional incandescent and fluorescent lighting. In areas with limited space, the low profile design increases the available headroom. LED technology makes this a fit and forget solution, reducing overall costs through extended working life.

All series meet DEF-STAN 61-5 part 6 issue 5, MIL-STAN 1275* and MIL-STD-461E.



Visible/IR Mode Beacon Light



IR Driving Light

de a rugged
and shock
angled head



OXLEY WINS CONTRACT ON THE BRITISH ARMY'S BOXER PROGRAMME

Oxley Group has secured its position as leading the global market in vehicle lighting following the award of the contract for LED lighting on the British Army's new Boxer vehicles.

The contract is worth £3.7M and has been jointly awarded by Rheinmetall BAE Systems Land (RBSL) and Rheinmetall Landsysteme (RLS).

Oxley Group will be providing internal lighting, directed lighting, search lights and IR lights on to Boxer vehicles until 2030, as part of the UK MOD's Mechanised Infantry Vehicle (MIV) programme.

The end-to-end design and manufacture of the lighting will be undertaken by a skilled team of 150 engineers and support staff at the Oxley site in Ulverston, Cumbria. This contract will support further growth and protect key manufacturing skills in the UK, including the apprentices currently receiving training within the organisation.

The Boxer vehicles will be equipped with the 'best in class' LED lighting. Oxley lighting solutions offer high-build quality and high performance, as well as meeting the most stringent EMC and power standards. Oxley has many decades' experience in manufacturing LED lighting with excellent optical performance and advanced technical characteristics, specifically designed for military vehicle applications.

Darren Cavan, Oxley Group CEO said: ***"We're delighted to be awarded this contract, to be part of a prestigious advanced technological platform such as the Boxer is confirmation of our world leading position in the provision of high-performance lighting for military vehicles and we look forward to working in partnership with the RSBL and RLS teams as this programme develops."***

Simon Fell, MP for Barrow & Furness commented: ***"This contract shows just how well regarded the fantastic Oxley team are. They are world-leaders in producing LED lighting for the defence industry and, in their 80th year, are showing that their brightest days***

remain ahead of them. This contract will secure jobs and enable the business to plan for the future, further cementing Ulverston's position as an advanced manufacturing centre. The team should be rightly proud of being selected to deliver this contract."

Stuart Evans, RBSL Project Director for the Boxer Programme said: ***"It is a pleasure to announce this latest contract award as it will not only help us to successfully deliver the Boxer programme for the British Army, but it will secure jobs and protect UK manufacturing skills."***

The Boxer vehicles will be equipped with the 'best in class' LED lighting.

"We are making great progress in developing the programme and we look forward to working with Oxley Group as we commence the next phase of the project."

The MIV programme aims to support and enhance the UK supply chain. As such, RBSL and RLS are part of a MIV Joint Procurement Team, which has engaged suppliers in England, Wales, Scotland and Northern Ireland. This contract is the latest in a series of supplier contracts for the MIV programme.



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WHAT ARE THE BENEFITS OF USING SERVER RACKS?

Every industry has valuable equipment that is fundamental to how their organisation performs. With this reliance on expensive equipment comes the need for suitable storage solutions and ways to ensure the protection of property. This is where server racks come in handy. Server racks can be used for many different purposes and are the ideal solution for keeping equipment safe and secure. There are numerous advantages of using server racks including them offering an improved level of security and neatly organising space. Here at CP Cases, we have decided to go that extra mile to offer customisable options for your server racks, designing them specifically so that they are more fitting and beneficial to your personal needs.

Customisable options

Having storage that is right for your specific requirements is crucial for effective work performance which is why CP Cases create personalised server rack designs for your individual needs.

A popular customisation feature is the addition of climate control systems that can prevent overheating, keeping all electrical equipment cool and safe. This can be highly beneficial to organisations that operate in extreme weather conditions such as within the marine and energy industry, where there is demand for server racks that are capable of withstanding hazardous surroundings. This feature can also be highly beneficial for those working with medical equipment, as it is often likely that their contents need to be kept at an optimal temperature in order to remain effective.

The ability to customise our server racks means that whatever shape, size or weight of content that needs to be stored, there will be a suitable and effective solution for you.

Along with additional features, the server rack can be customised with accessories including drawers or shelves.

Improving security

For optimal security, server racks can even be custom-fitted with system shielding's which have become increasingly more important as more complex electrical devices face the challenge of malfunctioning if wrong interacting with external systems. To avoid this, CP Cases offers EMI shielding, which adds another layer of security. TEMPEST shielding prevents sensitive equipment from emanating electromagnetic radiation that may carry classified information, helping to prevent risks of data leaks. EMI shielding however can be incredibly useful when storing multiple devices, as it stops the transfer of energy between technology, thus reducing the chances of malfunction. Improving the safety of highly valuable equipment is one of the most advantageous aspects of our server racks.

Organising space

By choosing the right server rack for your unique needs, you will be able to optimise your space, giving more order and functionality to the workspace. With a storage solution that has been designed to fit your specific contents, there is no wasted space and equipment can remain snugly fit, without the risk of moving around or getting misplaced. Many of our server racks, including the STRATORACK, are beneficially lightweight and stackable, meaning you can easily arrange your equipment upwards, optimising the floor space. In addition, the optional addition of integral wheels means your server rack can also be easily transported and no extra equipment is needed to assist with moving processes or future relocations.

Whatever the industry, using high-quality server racks can be incredibly beneficial and can change the way equipment is maintained and protected, whether that be from damage or from electrical interference.



BLOCS label printer from Lincad makes easy work of transporting batteries around the world



Lincad, a leading supplier of batteries and charging systems for military and other sectors, has designed an innovative Battery Logistics and Operational Compliance System (BLOCS) to simplify the process of recording states of charge of batteries in preparation for air transportation.

BLOCS is a label printing system and connects directly to Lincad's in-service battery conditioners and chargers, the Armada, Caravel Mk2 and Four Channel Caravel Mk2. It allows batteries intended for use with military equipment to be flown safely around the world in adherence to IATA regulations, with full traceability.

In 2016, IATA regulations changed to ensure that lithium-ion batteries could only be transported via cargo aircraft and only if they were at a state of charge of 30% or less. These regulatory changes

were implemented following several high-profile cases where lithium-ion batteries were identified to be the cause of fires on aircraft. At less than 30% state of charge, lithium-ion batteries generally have insufficient energy to go into thermal runaway, a process which exacerbates the combustion process. The regulatory changes initially proved problematic for manufacturers and shippers of lithium-ion batteries and Lincad was the first company to integrate a transport mode into its conditioners and chargers to allow the 30% state of charge limit to be achieved through the simple push of a button.

The BLOCS label printer is a further enhancement and automatically prints a status label for each battery being run through the transport mode on one of Lincad's conditioners or chargers. When a battery reaches the 30% state of charge limit on a charge or discharge cycle, a status label is automatically printed, each label indicating the exact state of charge and providing other identifiable data for that particular battery. Through this approach, batteries can be demonstrated to be safe to fly and traceability provided, allowing those in the supply chain, the end user and third parties to have confidence that compliance has been achieved.

BLOCS can be integrated with up to 32 conditioners or chargers at the same time. This reduces overall system costs, speeds up processing times and streamlines logistics. Using Lincad's six channel Armada conditioner, as many as 192 batteries can be processed simultaneously. The system comes as a factory add-on option and its automated, plug-and-play approach requires no external input from the end user following set up. Different conditioner and charger types can be attached simultaneously to offer maximum flexibility and convenience.

Lincad's conditioners and chargers can operate with a broad range of lithium-ion battery types. Through the characterisation of battery charge and discharge profiles and the development of battery interface adaptors, batteries from various OEMs can come under the umbrella of a single type of conditioner or charger. With the integration of a BLOCS label printer, a whole fleet of different batteries can be prepared for air transport, offering a step change in battery logistics management.

According to Peter Copplestone, Operations Director at Lincad, ***"Our innovative BLOCS label printer is the ideal solution for busy logistics teams operating in military and other sectors to ensure that all their batteries are not only discharged to IATA-required levels, but are***

accurately and clearly labelled too. Customers can use BLOCS for charge status labelling of their Lincad products, but also for batteries from other OEMs."

For long-term storage of lithium-ion batteries, a state of charge of 50% is generally recommended. In addition to a transport mode, Lincad's latest conditioners and chargers feature a storage mode to allow batteries to have their state of charge adjusted to this 50% level to prolong shelf life. The BLOCS label printer system can be used in the same way to provide evidence that batteries have been prepared for long-term storage.

Lincad has worked predominantly in the military sector since it was founded over 35 years ago. Key customers include the UK Ministry of Defence and defence prime contractors, along with other armed forces around the world, including those from NATO and the Five Eyes alliance. Lincad works closely with its customers to supply a wide range of bespoke batteries and charging systems, including its popular LIPS (lithium-ion power system) range of batteries and associated chargers. These are ruggedised products, capable of withstanding hostile environments and demanding applications. Lincad's products provide a sought-after, military grade performance that can be adapted across a range of sectors.



T: 44(0)1252 894600
E: enquiries@lincad.co.uk

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Lincad's BLOCS label printer makes easy work of transporting batteries around the world





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7 FACTORS TO CONSIDER WHEN SELECTING A MILITARY ANTENNA

Selecting a military antenna comes with many complex considerations to ensure it fits the application requirements. Here, PPM Systems, takes you through the seven key things to consider when choosing yours.

Choose PPM for your antenna systems - design & distribution

1. Frequency

The frequency range or bandwidth of an antenna indicates the range of frequencies over which the antenna has been designed to have an optimal Voltage Standing Wave Ratio (VSWR) and beam pattern for the antennas use case. If a wide bandwidth isn't necessary, a narrow band should be chosen, suited to the specific application the antenna is intended for, as this will allow for a better matched VSWR, and improved gain and beam pattern.

2. Power Rating

The power rating defines the maximum RF power that can be applied to the antenna without resulting in damage. Receiving (Rx) antennas generally receive low RF power so the power rating is almost exclusively only relevant for transmitting (Tx) antennas, where high powers are applied to ensure that an observable signal



is received by a receiving antenna after traversing a large distance. Applying more power than the antenna is rated for, could potentially cause irreversible damage.

3. Beam Pattern

Whilst an antenna may appear to perform well with a low VSWR over the frequency range of interest, the antenna may be focusing its power in the wrong direction. Depending on the application, a user may require an antenna with an omnidirectional beam pattern where the antenna is equally good in all directions, or they may require a directional antenna where all of the antenna's performance is focused in one direction. The beam pattern of an antenna is also frequency dependent so careful consideration needs to be made when choosing an antenna to ensure it is operating at all frequencies as expected.

4. Polarisation

The polarisation of an antenna describes the direction of the electrical field vector of the electromagnetic waves being transmitted. The most used polarisations are:

- **Vertical Polarisation** – where the electric field is in the vertical plane
- **Horizontal Polarisation** – where the electric field is in the horizontal plane
- **Right Hand Circular Polarisation (RHCP)** – where the electric field vector rotates in the clockwise direction relative to the direction of wave propagation
- **Left Hand Circular Polarisation (LHCP)** – where the electric field vector rotates in the clockwise direction relative to the direction of wave propagation.

As an example, a vertically polarised antenna will not receive a horizontally polarised signal, and it will only receive the vertical component of a circularly polarised signal, which will result in a received signal reduction of 3dB. Therefore, the polarisation should be chosen to match the signals and antennas used in the system to prevent potential signal loss.

5. VSWR

Voltage Standing Wave Ratio (VSWR) is a measure of how well matched an antenna is to a load or source. It is equivalent to return loss, which describes how much of the power put into an antenna is reflected back and thus the amount of power that is successfully transferred into the antenna. A VSWR of 1 indicates that all of the power applied to an antenna is successfully transferred into the antenna. Reflected power is unwanted as it means a reduced radiation power and it may interfere with components within a system's RF frontend, which could cause oscillations, in band ripple and even irreversible damage.

6. Size

Antenna sizes are heavily driven by the frequency/wavelength that



they are designed to work at, with higher frequency antennas being smaller. Different antenna technologies will be different shapes and sizes. Transmit antennas that are required to deal with much higher input powers than their receive counterparts will be physically larger. The dimensions, weight and portability of the antenna are important to consider as they affect where the antenna can be used and how easily.

7. Environment

Antennas are used in a wide variety of environments, some of which can potentially expose the antenna to harsh and hostile environments, such as large temperature swings, harsh sunlight/high levels of UV rays, high humidity, salty air or chemical exposure. There are also certain applications in which the radar cross-section and infrared emissivity are of concern. All of these factors determine the material construction, IP rating or other environmental specifications that are required to be met. Careful consideration must be made to ensure that the antenna you choose is sufficiently rugged for your application.

These considerations are just the key factors for selecting antennas to meet specific requirements in a complex system. You can contact PPM Systems (sales@ppmsystems.com) to discuss your requirements further or visit www.ppmsystems.com to view the range of antennas available.





ADVENTURE
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25th
ANNIVERSARY

www.adventuretactical.com

This past year has been challenging for many across the globe. The pandemic has affected all aspects of life: reaching families, borders, the economy, and businesses both large and small.

Adventure Lights Inc. – a business located in Beaconsfield, Quebec, Canada – has been fortunate to have been able to weather much of the storm. The company has created state-of-the-art research and development facilities that allow us to both improve existing capabilities while developing new cutting-edge technologies.

The company has won numerous awards, including four consecutive Innovation Awards in Canada, a Congressional Award for Program delivery with NAVAIR and a Tech Connect Defence Innovation Award. With our direct inhouse manufacturing and research and development capabilities, Adventure Lights new innovations are now available in both our new and established product lines.

In 2018 Adventure Lights launched *Adventure Tactical Inc.* and brought its associated company Quantum Marine Ltd. to the forefront of the Search and Rescue industry with significant contract wins. As part of our steady growth initiative and expansion across product lines, these respective companies have become known industry standards in record time.

While adopting the *Extreme Products for Extreme Conditions®* slogan, Adventure Lights is now focused on supplying products to the Outdoor Sports and Recreation enthusiast, while Adventure Tactical Inc. focuses on distributing Positive Identification Solutions to those on the front lines. Adventure Tactical will also continue to supply Landing and Drop Zone Lighting Systems for deployment, evacuation, and supply in harsh environments. Quantum Marine Ltd.'s main focus continues to be that of serving the SAR community with a substantial focus on waterborne operations.

With the expansion of the Adventure Lights' umbrella, comes the introduction of one of the most sophisticated I.F.F. Helmet Lights on the market, *the Trilobyte™*, available exclusively through Adventure Tactical Inc.



The Trilobyte™ launched at IDEX2019, quickly gained rapid adoption, and set a new industry standard. It caught the eye of the Defense and Security community globally and set-in motion purchase orders that the company is rapidly fulfilling. During 2020, the Trilobyte™ became one of the most highly sought, and deployed, I.F.F. solutions in the world.

In a time where NATO countries and their allies are focusing on Future Soldier Systems and Programs, the Trilobyte™ was tested and immediately adopted in East Asia as part of their Soldier Enhancement Program and will continue to be used for the next five years. In some Scandinavian countries the Trilobyte™ has been purchased as a complement to our venerable VIP and VIPIR product. As many militaries are currently upgrading their technology with new vision systems the Trilobyte is being adopted to provide best in class features and capabilities for current and future soldier initiatives. While you are reading this, more countries continue to adopt our technologies to enhance the safety of their soldiers and law enforcement officers across the globe.

The Trilobyte™, with its unique lightweight design, delivers unparalleled performance compared to other products in its category. The light boosts features such as Auto-Synchronization, Programming and Playback, Early Laser Warning Systems, Multiple Colour Outputs as well as NIR and SWIR outputs. While some features are documented others remain unshared, except for use with some of the world's most exclusive and Elite Special Forces Teams.

The Adventure Lights group instills a culture of durability, dependability and innovation in its people and products that exceeds that of our competitors. This has been proven repetitively over our 25-year history. Our *VIP™* and *VIPIR™* products have become iconic with Special Forces and are still in active service after over two decades. This legendary product first hit the market in 1996, and like the Trilobyte™ today, the VIPIR™ became the standard for Special Forces.



The VIPIR™ continues to be unsurpassed in durability, versatility, and effectiveness in action – it remains the clear choice when compared to everything else in its category – and many Militaries continue to purchase this product built on the trust they have in its performance.

In 2020, Adventure Tactical, in collaboration with FinnProtec, was able to secure one of the most sought-after contracts published by the Finnish Ministry of Defence in recent years. The Minister of Defence authorised the Defence Forces Logistics Command to sign contracts for the procurement of weapon lights, helmet lights and Identification Friend or Foe beacons for soldiers. The procurement was preceded by extensive field tests conducted in Finland in which the suitability and compatibility of over 25 products were evaluated. These procurements were included in the national defence development programme and are part of the overall infantry night combat capability development. These procurements are aimed at building infantry troops' ability to fight at night, especially in poor visibility conditions. The I.F.F. Beacon chosen was our venerable VIPIR™. The first products will be delivered by the end of 2021 and taken into use starting from 2022. The overall value of this procurement is more than EUR1 million.

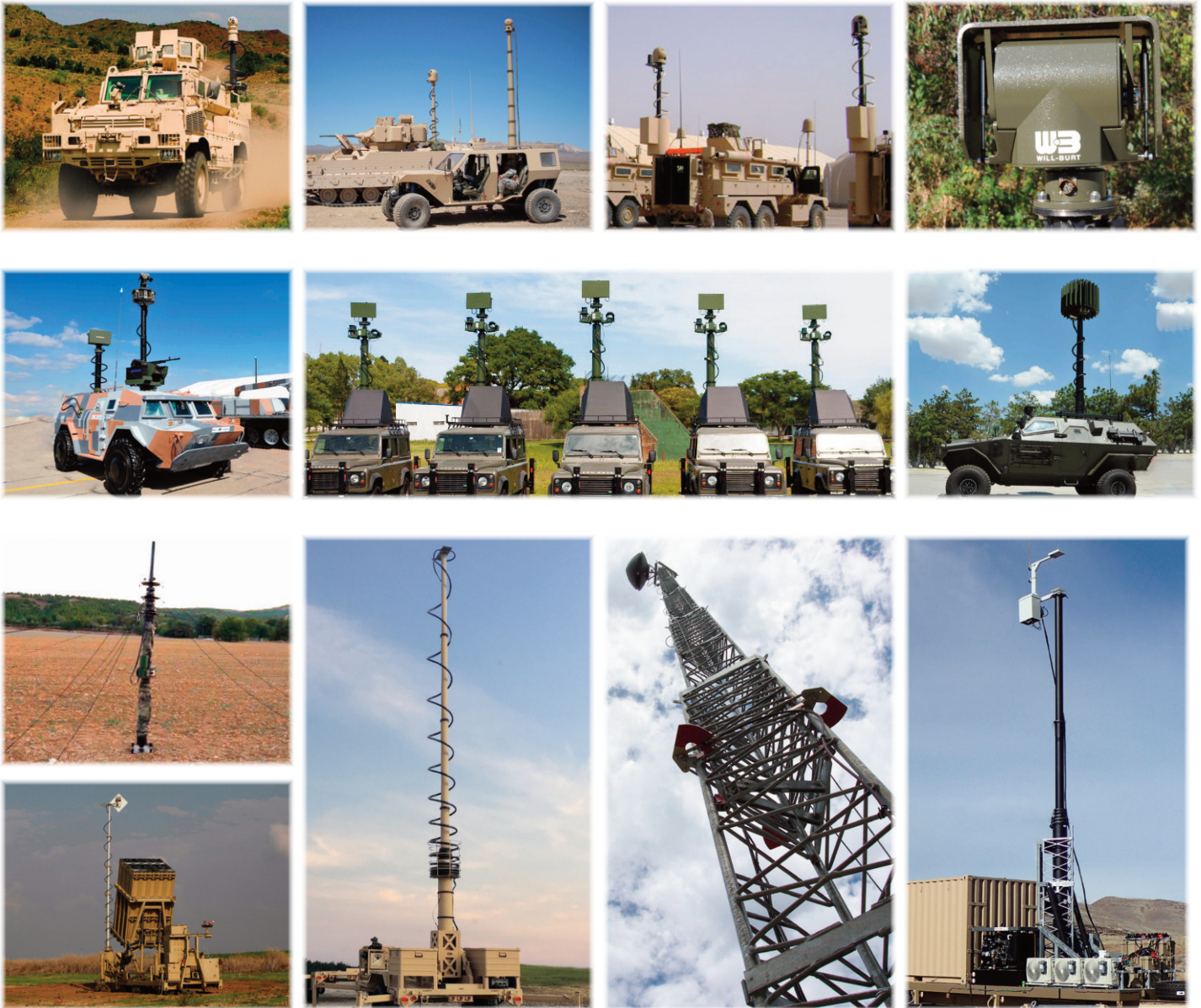
These are mere examples of the success that our group has been reaping, quietly (we are Canadian after all). As we celebrate our 25th anniversary, we also celebrate maintaining both our build quality and technology lead. From Personnel recovery and Identification Systems to Vehicle Identification & Safety Systems, and through our Expeditionary Landing and Drop Zones, the Adventure Lights group of companies offers a complete solution to many challenges.

While we continue to deliver trailblazing technologies to enhance soldier safety, we also pride ourselves in being socially and environmentally responsible. We have recently added a Renewable Energy Man Portable Power System which helps reduce battery waste on the front lines as well as help the user maximize their power sources. This initiative directly reduces the quantities of batteries purchased, reduces waste, and saves hundreds of thousands of dollars.

On our 25th Anniversary, we are proud to be one of the oldest companies in our industry and want to thank all those who have trusted our brand, on the battlefield at home and abroad. Your enhanced safety is our continued goal whether it is at sea, in the air, or on land – When Success is Vital™ we are there to help provide solutions to successfully complete the mission.

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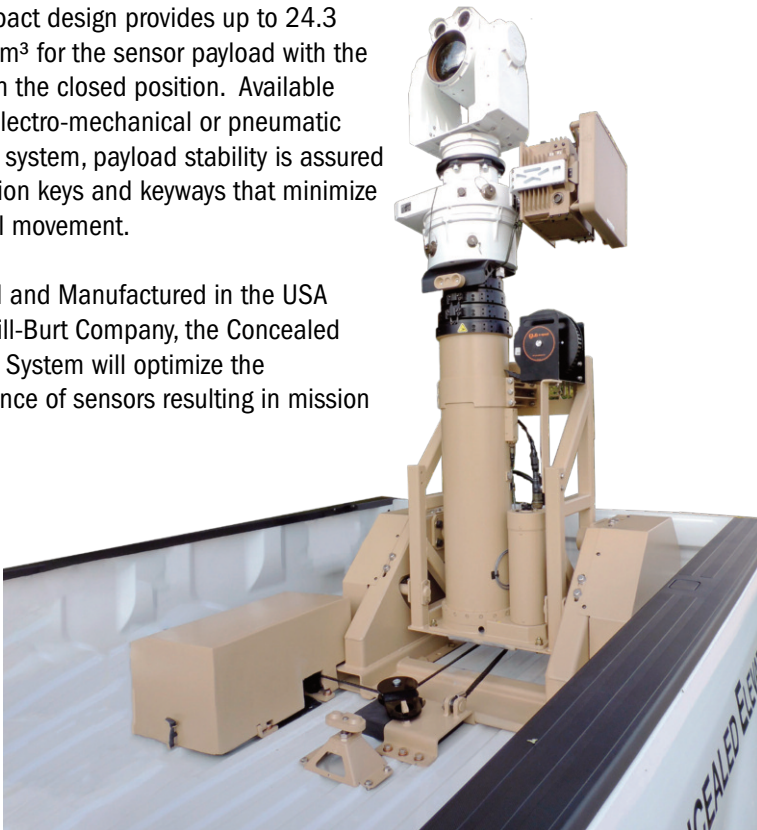
The Will-Burt Company is the world's premier manufacturer of mobile telescoping masts, towers, trailer systems, and pan and tilt positioners. We offer virtually every mobile payload elevation solution and full integration services for defense, government, first responders, telecommunications, energy production and other markets. Will-Burt also offers contract manufacturing, metal fabrication, powder-coating, and rapid prototyping services. We are an international company with offices and manufacturing in the USA, United Kingdom, Germany, Turkey, and Singapore. All manufacturing locations are backed by a certified ISO 9001:2015 Quality Management System. Incorporated in 1918, Will-Burt is an employee-owned company. Will-Burt products are manufactured to meet the most demanding environmental requirements and are certified to MIL-STD-810 standards.

Concealed Elevation System

Will-Burt's Concealed Elevation System is a rugged and precise mobile elevation platform that provides rapid deployment of a wide variety of sensors from a concealed position in a standard 8' pickup truck bed.

The compact design provides up to 24.3 ft³ / .69 m³ for the sensor payload with the tailgate in the closed position. Available with an electro-mechanical or pneumatic elevation system, payload stability is assured with section keys and keyways that minimize rotational movement.

Designed and Manufactured in the USA by The Will-Burt Company, the Concealed Elevation System will optimize the performance of sensors resulting in mission success.



GEROH SPM



The GEROH SPM mast, the strongest and most accurate mobile mast, is now available in a compact, low-profile design. This low-nested mast allows a payload to be stored inside the vehicle to protect the valuable sensor.



All Will-Burt products sold for Defence are MIL-STD 810 certified by a third-party.

AVON PROTECTION UNVEILS EXOSKIN™ RANGE OF CBRN BOOTS & GLOVES



Scan here to watch
the EXOSKIN™ video.

Avon Protection has developed a new range of products to protect military personnel operating in CBRN environments: the EXOSKIN™-B1 High Traction CBRN Boots and EXOSKIN™-G1 Tactile CBRN Gloves.

The CBRN threat is a growing concern for military forces, with the use of chemical weapons rising among both state actors and terrorist groups. In response, Avon Protection developed the EXOSKIN™ range of boots and gloves to supplement its CBRN respiratory protection products to protect personnel without compromising the wearer's tactical agility in the field.

Designed to allow for the handling and operation of electronic touch screen devices, the EXOSKIN™-G1 glove offers a critical operational advantage. The ambidextrous glove features a rubberised outer layer textured to maintain grip in wet conditions, with an intelligent, seamless inner knitted liner that has a

conductive tip on both the thumb and forefinger. Together these layers optimise the wearer's dexterity and allow them to complete their mission safely.

The EXOSKIN™-B1 boot provides improved durability and agility in the field, with quick-release straps to secure the garment over standard footwear. A highly textured sole improves the wearer's manoeuvrability in all underfoot conditions. In addition, it is 100 percent leak tested.

Manufactured from Avon Protection's proven rubber technology, both the EXOSKIN™-G1 glove and EXOSKIN™-B1 boot offer Chemical Warfare Agent and Toxic Industrial Chemical protection and are impermeable to biological agents. Designed for quick donning and doffing, they integrate with many protective suit ensembles including JSLIST and MkIVA.

"Since the end of the Cold War, many nations have become more aware of

the CBRN threats faced on the modern battlefield as we continue to see nerve agents and chemical weapons deployed in the field," said Steve Elwell, Vice President Europe, Middle East, Africa and Asia for Avon Protection. "Personnel must be able to operate safely on a contaminated battlefield without relying on cumbersome protection measures."

"In developing the EXOSKIN™ range of CBRN protective garments, our focus was to optimise end-user versatility in the most demanding environments, while continuing our relentless pursuit to keep operators safe from these chemical and biological threats."

With more than 100 years of experience delivering innovatively designed and engineered CBRN solutions, the EXOSKIN™ range leverages Avon Protection's material science capability and deep knowledge of protective CBRN technology.



EXOSKIN™-B1



EXOSKIN™-G1

CBRN Experts

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Proven Rubber
Technology

Quick Donning
& Doffing

Ambidextrous
Fitment

Ruggedised Quick
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27 Adjustability
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Compatible

Optimised
Tactical Grip

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PROTECTION



ENVIRONMENTAL RISK REDUCTION

Adler and Allan announced as finalists in four categories in the 2022 British Ex-Forces in Business Awards

Adler and Allan has been announced as finalists in four categories in the 2022 British Ex-Forces in Business Awards, the largest business celebration globally of the Armed Forces community.

Adler and Allan has been shortlisted in the Employer of the Year category. Adler and Allan

understand the powerful advantages of hiring from the Armed Forces community. We're a stronger business because of our service leavers and proud to have earned the Defence Employer Recognition Scheme's (ERS) Bronze and Silver Awards.

Aaron Robinson has been shortlisted in the

BRITISH EX-FORCES IN BUSINESS AWARDS

EMPLOYER OF THE YEAR AWARD

2022 FINALIST

8 September 2022, London
exforcesinbusiness.co.uk

ADLER AND ALLAN

#exforcesawards

BRITISH EX-FORCES IN BUSINESS AWARDS
HEADLINE SPONSOR **BARCLAYS**



Rising Star category. After a distinguished 16-year forces career, Aaron Robinson joined Adler and Allan's Computer-Aided Design (CAD) team in 2018. In just four years, Aaron has moved from committed serviceman to first-class commercial manager, emerging as one of Adler and Allan's brightest business leaders.

Ben McNally has been shortlisted in the Military Values in Business category. Ben McNally joined Adler and Allan during his resettlement period following six years as a Design Draughtsman for the British Army. Where others would give up, Ben simply gets on with the job, working with honesty and character, generating measurable results, and treating his team with fairness and respect.

Jim Eden has been shortlisted in the Engineering Excellence category. When Jim Eden joined Adler and Allan in 2006, he brought with him an exceptional engineering skillset. His military training means you can throw the hardest job at him and he will engineer his way out of it.

The Awards programme is a powerful vehicle for increasing visibility of both role models and

career opportunities for veterans, and educating employers on the exceptional transferable talents among military service leavers. This year's UK shortlist exhibits the second-career achievements of over 200 veterans and reservists, whittled down from a record-breaking 700 nominations. The breadth of opportunities available to veterans are evident through the big variety of sectors represented on the shortlist.

The winners of this year's British Ex-Forces in Business Awards will be announced and celebrated at a sparkling ceremony on 8 September. Broadcaster Jacqui Oatley MBE will welcome over 1,000 business and military leaders to the Grosvenor House hotel's prestigious Great Room on Park Lane. As well as hosting the highly anticipated awards ceremony, Oatley will introduce a programme of live entertainment and special guest speakers including Air Marshal Dame Sue Gray, the UK's first female three-star officer.

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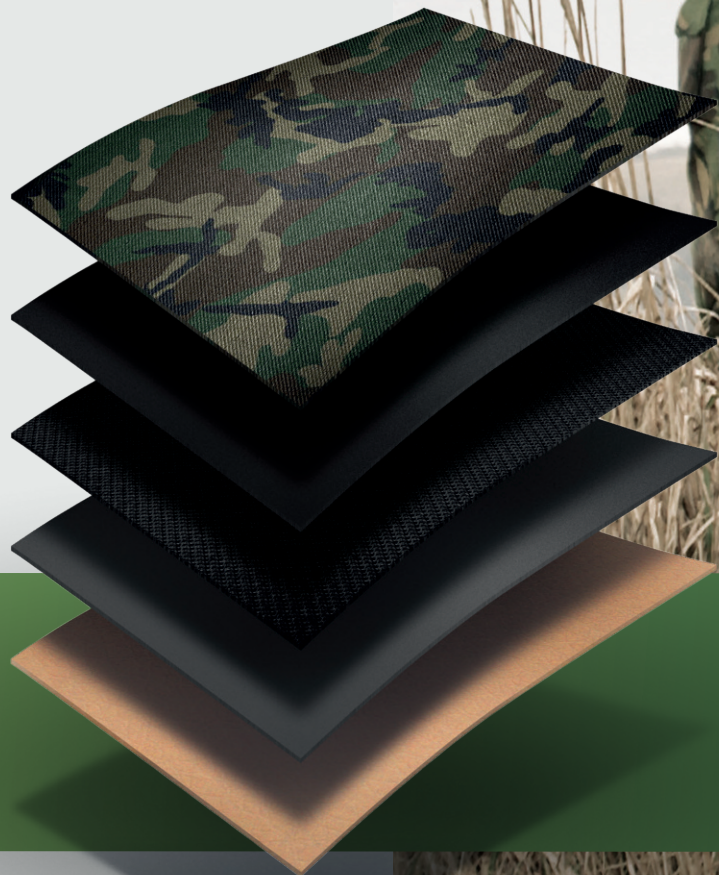
Flexzorb™ - The flexible, lightweight protective textile that is widely used by many of the world's leading defence vendors, making us the leading provider of activated carbon cloth for defence applications.

Lightweight and breathable, Flexzorb is used in a range of defence applications, including:

- CBRN Respirator filtration media
- CBRN Personal protective equipment (PPE)
- CBRN decontamination wipes
- Missile decoy media
- Phosphine gas adsorption media

WHEN FAILURE ISN'T AN OPTION

Chemviron, the European Operation of Calgon Carbon Corporation, has a long history of protecting and defending troops with our activated carbon products, and we remain committed to providing adsorbents to combat chemical warfare agents. In an environment where there is no room for failure, why wouldn't you rely on products that have been used and trusted for over half a century?



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Acceleration, Vibration, Radiation... It's A Jungle Up There.

Quartz crystal oscillators are the frequency source of choice for a variety of functions in virtually all military and aerospace systems.

However some of their superior qualities, such as high frequency stability and low noise, can quickly degrade when they are exposed to the extreme operating environments associated with these applications.

Shock and Vibration Effects

For oscillators used on mobile platforms, vibration and shock effects can be significant. While crystal oscillators can be designed to withstand extreme levels, these effects can be the limiting factor that determines the achievable performance in any given system.

Random vibration, for example, will show up on the output spectrum of the oscillator as an increase in the noise floor. The amount of degradation is determined by (1) the level of vibration and (2) the acceleration sensitivity of the oscillator. The effect can range from barely noticeable to catastrophic. The severe vibration experienced on a missile system or other airborne platform can cause phase noise to degrade by as much as 50dB to 60dB.

Temperature Extremes

The temperature conditions often present in military and aerospace environments are another critical factor that impacts signal source performance.

The frequency vs. temperature characteristic of the oscillator will be determined primarily by the quartz crystal itself. Most MHz range crystals are cut to conform to a temperature curve in the "AT" family of cuts. The temperature coefficient of these crystals is relatively flat compared to other passive components. Even over the wide range of -55°C to +125°C, the frequency error can be as small as ± 20 ppm.

For many applications better stability may be needed – and temperature compensation can be added in order to reduce temperature error to < 1 ppm.

Radiation Environments

When a device will be deployed in space, some level of radiation tolerance is required.

For satellites deployed in Low Earth Orbit (LEO), radiation tolerance of up to 50 krad(Si) TID (total ionizing dose) is required. TID is a cumulative deteriorating effect over time at some rate.

Deep space and other missions will require a tolerance of 200 krad(Si) TID or greater. Single Event Effects that can occur randomly – due to impact with a heavily charged particle – must also be taken into consideration.

Oscillator design for radiation tolerance also demands close attention to all the components that are used in the device. While most passive components are inherently radiation tolerant to a high level, some commercial semiconductors are sensitive to TID levels of only a few thousand krad(Si).

Radiation hardened devices are manufactured with special processes and are extensively screened and tested on a lot-by-lot basis, with an attendant increase in cost. The trend for commercial LEO satellite systems, for example, is to carefully evaluate and test lower cost COTS (Commercial-Off-The-Shelf) components to find designs with acceptable performance. This approach requires a certain level of risk acceptance that may not be appropriate for military and related applications.

Please visit www.greenrayindustries.com for additional resources and information about frequency control solutions for military and aerospace systems and applications.



Ultra-High Reliability Reference Sources for Mission Critical Apps.

For over 60 years, Greenray quartz crystal oscillators have served as high reliability reference sources for industrial and military applications that require low g-Sensitivity and excellent phase noise in order to optimize system performance while operating under the most demanding environmental conditions.

State-of-the-art vibration compensation enables our oscillators to deliver excellent phase noise performance and the short and long-term stability necessary in high shock and vibration environments.

Leveraging our extensive design and manufacturing experience, Greenray space-qualified TCXOs have been designed specifically for LEO (low earth orbit) satellite applications and/or deep space exploration. They offer guaranteed, long-term performance under radiation exposure from 30 krad(Si) to 200 krad(Si) TID.

Our T1254, T1354, T1276 and T1282 Series TCXOs are ideal for high orbit transponders, LEO nano/micro satellites, RF telemetry systems, multiband converters and upconverters.

The Y1631 Series clock oscillator is available from 60 to 130 MHz and combines low phase noise *and* ultra-low g-Sensitivity performance (to $5 \times 10^{-11}/g$). It features a 0.68" sq. SMT package, +5 Vdc supply and +10 dBm sinewave output. It is ideal for a variety of aerospace-specific and other applications.

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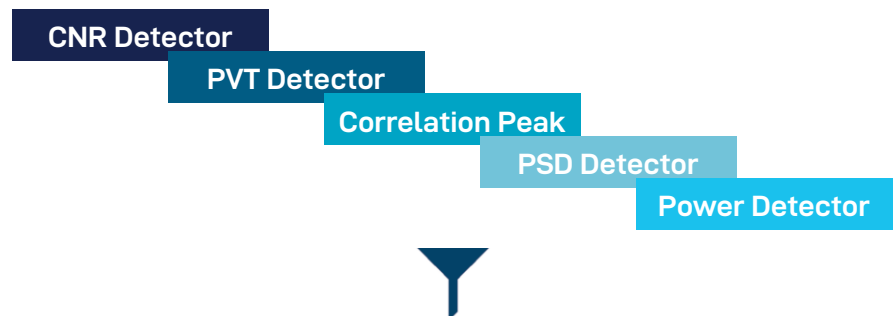


✦ LEO & Deep Space ✦ Radar ✦ Mobile Communications ✦ GPS ✦ Detection & Identification ✦

GNSS integrity matters!

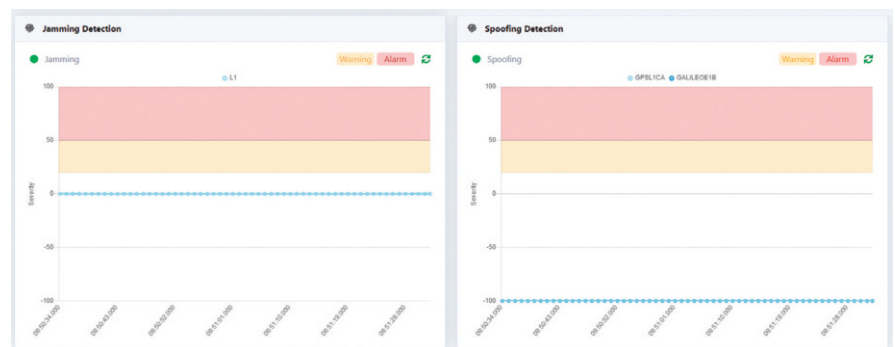
Global Navigation Satellite Systems (GNSS) positioning and timing services form the backbone of many applications and markets. Civilian GNSS services are free of charge and globally available but insufficiently protected against unintentional and even intentional disturbances. OHB Digital Solution researches for more than 20 years on how to provide means to monitor and augment the GNSS services with GNSS quality assurance. For many applications, it's not only precision that matters, but predominantly integrity too! OHB's knowledge and experience in GNSS quality assurance are available in many different forms in our GIDAS product family.

1 Multiple detection techniques (no extensive list)



2 Weighted combination of multiple techniques to improve robustness

3 Simple to read and interpret decision metrics for jamming and spoofing

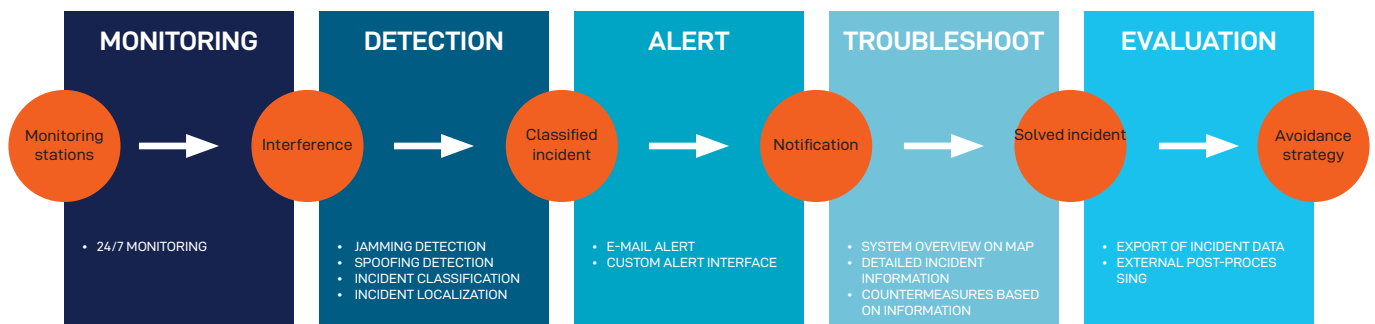


The core and heart behind the GNSS interference detection & analysis system (GIDAS) product family is OHB's knowledge of and experience with a multitude of different radio frequency interference detection techniques. We built up our experience in the course of more than 80 research projects, measurement campaigns and permanent on-site installations within the last two decades.



Each available detection technique operates best in a very distinct working range, only with the smart combination of a wide range of different techniques a robust determination of either jamming or spoofing is possible reliably.

On this foundation, the GIDAS product family is built to support our customers in reliable GNSS applications and operations. OHB Digital's core concept of safe and integer GNSS navigation foresees a multiple layer approach.



By constantly monitoring the GNSS signals, GIDAS is capable to detect, classify and even localize a radio frequency interference source in near-real-time. A wide range of GNSS users takes the ubiquity and free availability for granted, without considering the vulnerability of GNSS leading to misleading navigation or undetected failure. Awareness of the presence of GNSS interference is the first step of mitigation. As every customer application comes with its very distinct requirements OHB offers GIDAS features in different shapes. But all GIDAS product derivatives have one thing in common – the rock-solid experience of OHB in dealing with GNSS interference.

GIDAS adds to the operational safety of many different GNSS reliant applications. OHB's GIDAS is already operational in ports and airports, to help to secure GNSS navigation. The GIDAS product family addresses system manufacturers equally as end customers with a requirement on reliant GNSS positioning or timing. We bring our knowledge to your platform, product, service, or operation.

A first step of safe GNSS applications is the awareness of present threats – **GIDAS** detects, classifies, localizes and alerts if GNSS is about to be interrupted. OHB makes your GNSS-dependent application more robust and reliable.

Get in touch with us to learn how we can make your GNSS-based operations safe!





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- Reduces optical interconnect SWaP with rugged, qualified, edge-mounted, optical interconnects.
- Simplifies VPX board assembly and rework by enabling fiber pigtail on edge-mount transceiver.



Connectivity

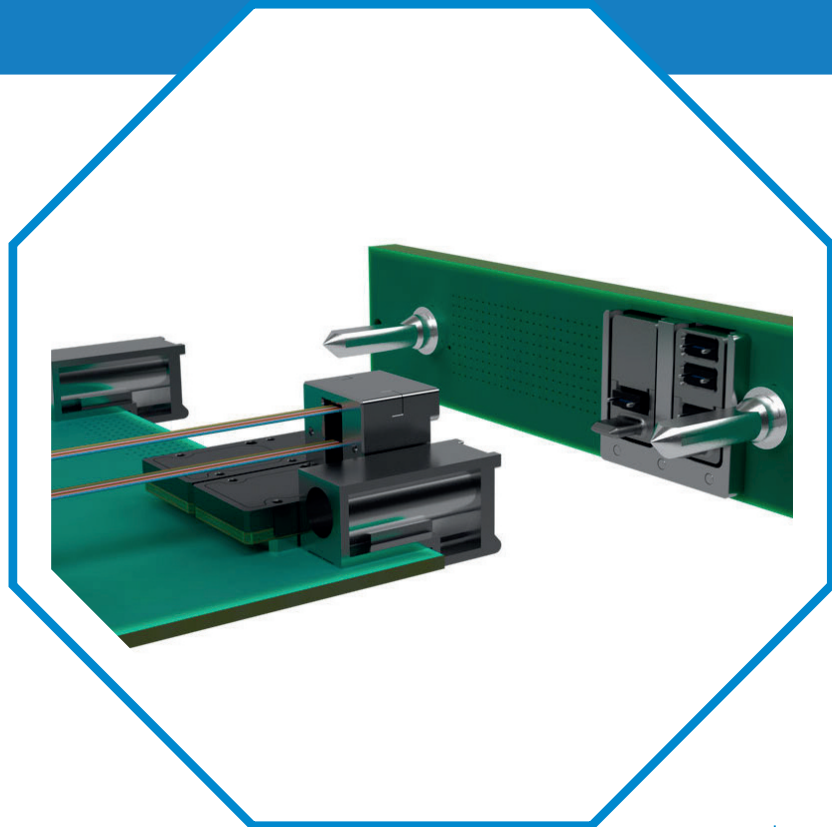
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Custom Designs for SWaP-Focused Connectors

The SWaP initiative has helped connector manufacturers focus on improving smaller and lighter connectors, in particular for custom designs.

As we demand our circuits do more and in smaller packages, we still need reliable power and signal transfer.

Today's designers have a number of new tools and options for cable and connectors that help them adapt to a rapidly changing electronics industry. Customized connectors can be designed to include sets of 3A and/or 5A power lines adjacent to micro and nano signal lines to meet SWaP expectations. These devices offer smaller, lighter-weight interconnect systems with a mixed variety of signal and power levels that still perform well in rugged and extreme environments. For example, we now use custom connectors that include combinations of USB 3.0 digital circuit speeds and are simultaneously running power sources that use 5A currents for highly portable military and airborne equipment.

The SWaP initiative employed by the US military and NASA has helped connector manufacturers focus on improving smaller and lighter connectors. By adding power pins inside the same connector with signal pins, the designer reduces the number of cable and connectors he has going to and from his electronic module. This is essential in

new space and remote-controlled drones as well as portable systems used by ground troops. The number of signal pins and power pins will vary from application to application and each design may be unique unto itself. The good news is that tools today can reduce both cost and time to design for these new mixed signal connectors. Custom is no longer a bad word in the application-specific connector world.

Designing Custom Connectors is Easier

Updated design tools that use solid models can speed up concept drawing and provide the system engineer a visual and size specification in a matter of days. Connector designers have a broad family of COTS and standard designs already available from which to hinge changes. Often a standard connector can be changed into a custom application quickly with the use of an alternate insulator. Some suppliers stock solid insulator plugs and can machine first-article connectors to hurry the design to completion. Costs are significantly lower than with the older methods of full-custom design. When a new connector metal shell system is needed, the supplier can use automated CNC machines to rapidly cut early prototypes directly from data received from his solid modeling software.

Find a Good Supplier

Finding a good a supplier for SWaP-focused custom connectors can be rather straightforward. First and foremost, look for a manufacturer with connector experience in all of the key areas. The company should have worked with the combination of microminiature sizes, ruggedized reliability, and multiple designs using power and micro or nano signals in one connector. Ask for examples of current products that handle both power and digital signal in one connector. Secondly, simply ask for a solid model of what you are thinking about by giving some of the criteria listed below. The manufacturer should be able to deliver the models in a reasonably short time. Suppliers with experience and technical capability will rise to the top. Look for signal integrity and test capability. System designers should



*Breakaway Micro
Hybrid Circular*

ensure that a combination of test requirements are available from the supplier. As digital signal speed increases, ask to talk with the supplier's signal integrity engineer and request high-speed test data, simulations, and/ or eye diagrams of its products. Also ask for the supplier's capabilities for testing high current levels and current surges to ensure the power portion of the connector meets expectations.

Key electrical considerations for the system design engineer include some of the following (each affects both the cable and connector design):

- What is the amperage demand for the system that the connector is serving, and will two wires handle demand and ground? If not, how many wires? Is there a de-rating factor on current limits? Is there a set dielectric-withstand voltage needed to prevent breakdown?
- Is the signal system in the connector analog or digital?
- What is the speed of each signal in the cable, and is there an impedance match required?
- Will it include high-speed digital signals that require differential signal wiring in the cable?
- What is the electromagnetic environment the cable and connector must work within and how much shielding is necessary to ensure high signal integrity?
- Will signal crosstalk become a problem between signals within in the system?

Key physical considerations are just as important. They include:

- Is the mechanical design able to receive round, rectangular, or stacking connectors?
- Does the connector go through a panel into a device or is it on the end of a cable connecting onto a probe or sensor. If it is a probe, is it vulnerable to shock, crush, and even chemical exposure?
- Is the connector pin/socket mating system designed, tempered, and plated to meet high-reliability performance used in space and military-type applications?
- How much room is available and is the shape critical?
- Is there exposure to high shock and/or continuous vibration?
- Are there extreme temperature or environmental considerations to prepare for?



hybrid circular



Micro Nano SWaP-R

Custom Power and SWaP Connectors Available Today

Established micro and nano connector manufacturers that have offered military specification 32139 and 83513 now offer a wide range of design variations from their existing products. Both rectangular and circular formats are readily available.

Custom power D-shaped micro connectors at .050mil spacing, a popular design for new applications, evolved from established standard D-shaped connectors. Omnetics' high reliability Micro-D connectors are a good example and are available with mixed power/signal contact layouts. The number of power and signal contacts may be specified to provide the greatest flexibility in circuit design while ensuring that the connector is kept to the absolute minimum necessary size. This hybrid combination eliminates the need to have a D-sub type or other higher-power connector next to the Micro-D, making it easier for the operator who now only needs to mate a single connector. The power contact can handle 20 – 24AWG wire and is suitable for currents of 7A to 10A. These hybrid connectors can be available in wired or through-hole PCB-mount termination types. The wired power contact is an insertable/removable type contact, which can be optionally supplied for customer termination, except for thru-hole leads that are permanently installed. These options can be packaged in the conventional screw-together-type Micro-D shells or the Omnetics quick-latching Micro-D form factor.

Custom connectors with mixed power and high-performance signal contacts have come of age. The move away from older standard designs has been empowered by the use of new tools and solid model designs to package highly established standard pin-and-socket elements with years of high-reliability experience. Devices use military-grade materials, internal elements, and design standards to achieve SWaP performance.

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CUSTOMIZATION

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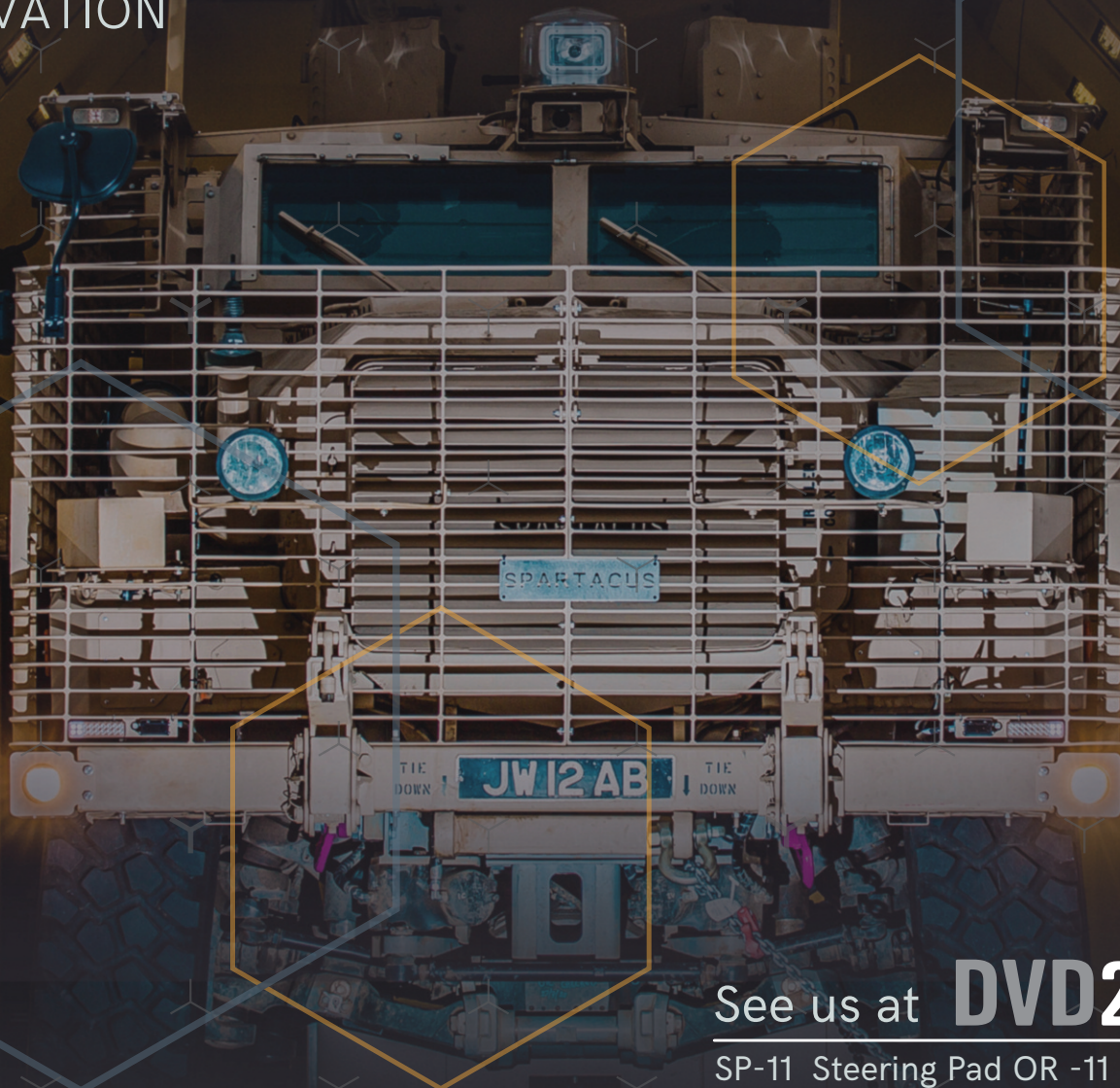
Omnetics' techniques enhance ruggedness and durability.

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ADVANCED SOLDIER SYSTEMS

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UK's leading independent paint manufacturer



Make UK Defence, the national not-for-profit, member owned defence trade association, part of Make UK – has welcomed HMG Paints as its newest member.

Make UK Defence champions and celebrates the UK's defence & security industry and provides a opportunity for collaboration between SME's and the Defence industry. HMG Paints, the UK's leading independent paint manufacturer, brings its portfolio of Def Stan coatings and bespoke paint and coating formulation services to the group.

All of HMG's Defence coatings, including its Def Stan 80-225 system, are Made in Britain accredited, which means the company can provide fast delivery, something which has become increasingly important to its customer base over the last few years.

"We're really looking forward to working with the Make UK Defence team and their members", commented Alan



Sharples, HMG Defence Sales Manager. ***"Already in our early connections with members we've heard how members have struggled to acquire paints and coatings, which are often imported from abroad, and HMG are keen to build partnerships to help fulfil paint requirements for future projects"***

HMG to attend DVD 2022

HMG Paints, will be attending the DVD2022 exhibition in September where Make UK Defence members and non-members can meet the HMG team face to face. The attendance at the show will allow engineers and specifiers to discuss in person their defence coating requirements. HMG's Defence Technical Support team will be on stand C3-819 at the show which takes place between the 21st and 22nd September at UTAC Millbrook.

The DVD2022 show will give defence personnel the chance to discuss paint and coatings technical requirements directly with the HMG team. HMG Paints' Technical Support service is aimed to take the hassle out of identifying and sourcing the correct products for Defence projects.

This includes the identification of Def Stan or NSN number or even developing bespoke solutions for OEM and manufacturers projects. If you'd like to book a meeting slot or require information on the HMG Paints products you can email **defence@hmgpaint.com** and a member of the team will assist you.

Make UK Defence championing SME's

The Defence sector accounts for £12billion GVA, and employs directly and indirectly through supply chains more than 200,000

highly skilled employees. However, significant barriers to expansion remain, especially for SMEs, when looking to take advantage of opportunities and trading with other markets. Make UK Defence however are determined to champion SME's and the best of British manufacturing. ***"By working closely with the sector and freeing up the agility and dynamism of SMEs we can cross-pollinate the success of the defence sector to maximise economic gains, seize export opportunities and build greater supply chain resilience. This will place an innovative defence sector at the forefront of helping address the many challenges society faces."*** Commented Andrew Kinniburgh, Director at Make UK Defence.

"We're exceptionally proud to be a British paint manufacturer in an industry dominated by Multi-National Enterprises. All of our products are made right here in Manchester, and this allows us to quickly service our customers paint and coatings requirements."

"With more and more paint manufacturers offshoring production and decision making we feel HMG can provide a unique offering to both OEM's and SME's within the defence market" commented Alan. ***"Since 2019 we have been working alongside a number of new partners to assess their coatings needs and support them directly by supplying a range of Def Stan and bespoke paints coatings along with on-site technical support."***

Following an increase in demand for its Def Stan 80-225 product range and the product is now stocked and available for

immediate despatch across the UK. All coatings, including additional Def Stan coatings from Temporary Marking Paint and Walkway Coatings to Environmentally Compliant 2K Epoxy Topcoats are Made in Britain and distributed across the globe and supported by industry leading technical support. You can find out more about HMG's range of Def Stan products and bespoke coatings development service at **www.hmgpaint.com/products/landing/Defence**.

The HMG products in this range are free from Chrome VI, meet low VOC requirements, and are IRR and CARC resistant. As an agile UK based manufacturer, HMG Paints is able to provide products on demand, reducing extensive lead times previously experienced within the market.

Alongside Defence Standard products, HMG produce a wide range of approved high-quality coatings for practically every purpose for the defence industry. Made in the UK, HMG's product range is suitable for equipment such as containers, trailers, vehicles, bridges and armour.

To see a full list of HMG Paints products and services visit **www.hmgpaint.com** via the website you can also find out more about the company's history and partners.

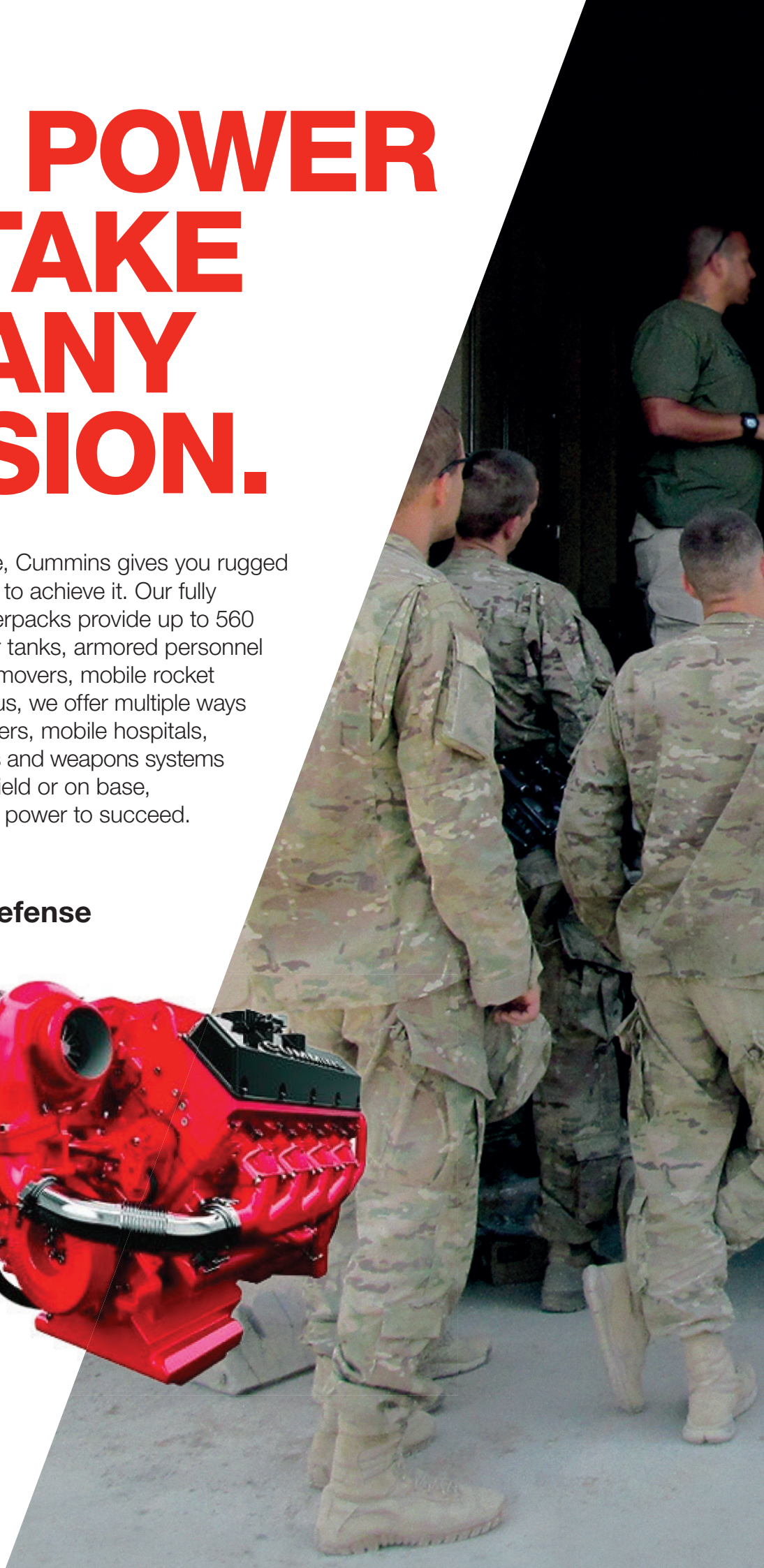
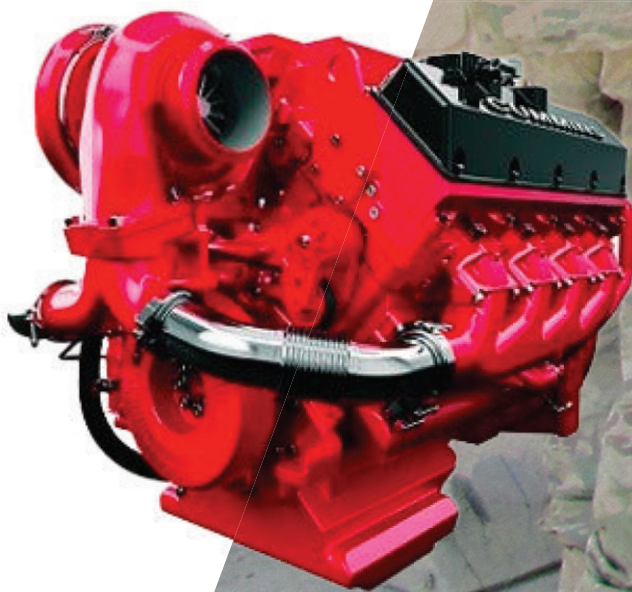
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4GD

Over the last five months urban warfare has been in the spotlight with the war in Ukraine.

In particular it has highlighted the importance of combined arms operations and the employment of these assets at the tactical level. As well as reinforcing old lessons, new ways of operating have been identified, iterated, and improved throughout the conflict.

For those not engaged directly in the war, this raises the question of how we can keep pace with these changes. Training for combined arms operations is resource intensive, difficult and dangerous but demonstrably essential. Furthermore, to develop competence training must be conducted regularly.

At 4GD we believe that the solution to this lies in the employment of blended Live & Virtual urban training environments, where the strengths of each domain can combine to deliver a capability greater than the sum of its parts. Where possible, urban training should take place in the Live environment. Soldiering after all is an arduous activity that requires dexterity and an intimate understanding of the dynamics of one's team; something which cannot yet be delivered satisfactorily using Virtual systems. Where these systems come into their own is in replicating high-cost combined arms assets. The key, though, is in linking these two environments together so that Virtual and Live can be



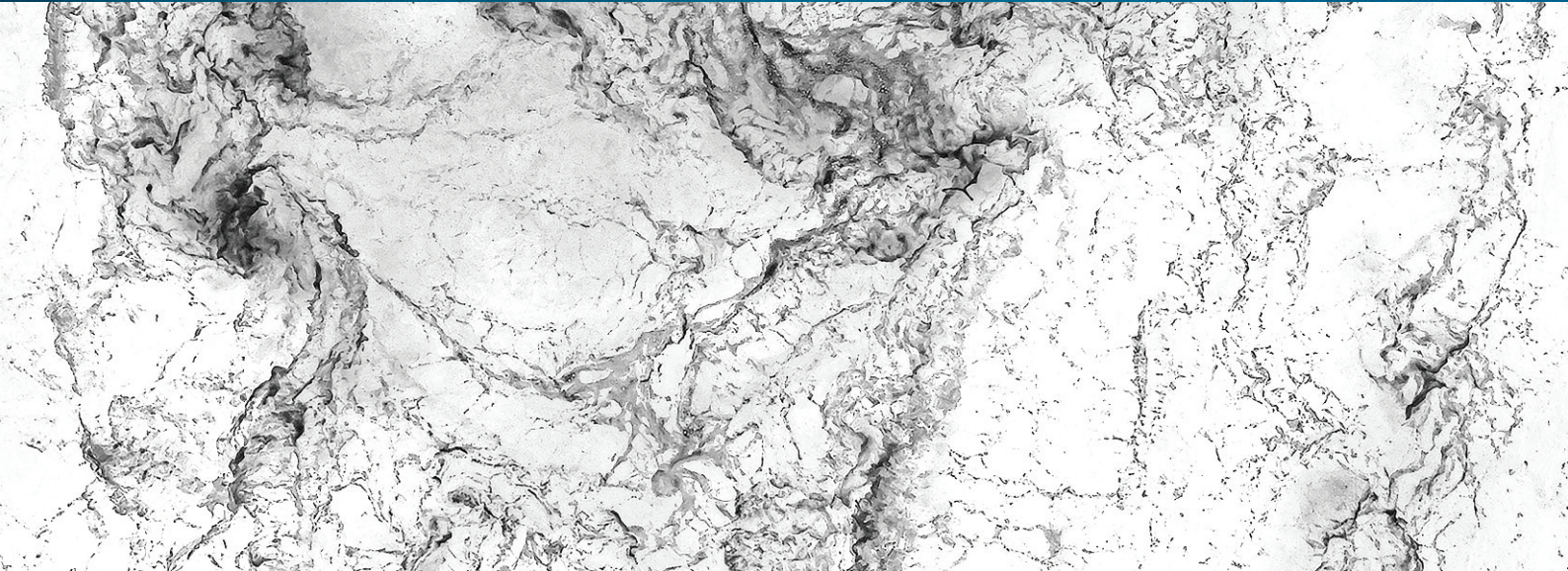
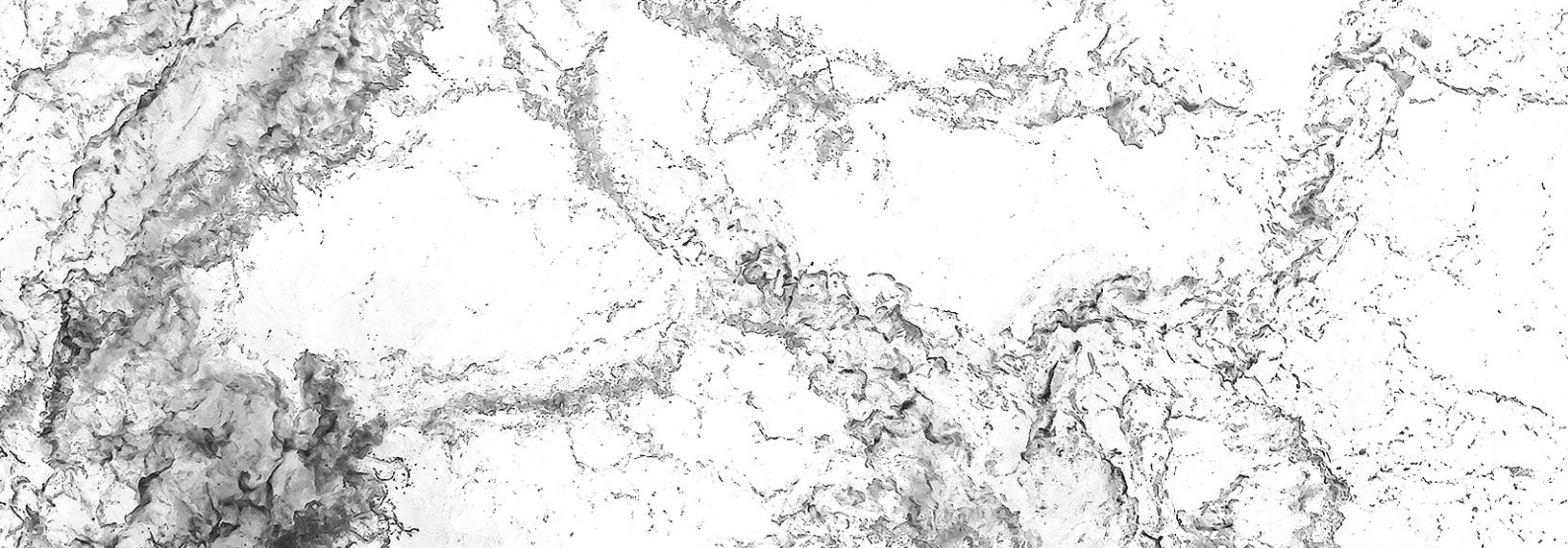
exercised together. Imagine a street clearance being conducted by physical troops who simultaneously have their actions rendered virtually in a digital twin of the objective. This virtual render could then be sent to a Commander using a dismounted situational awareness device in the form of a drone feed, who is then able to control the FLOT using this virtual drone. If armed the same Commander can use the synthetic drone to strike an enemy position. In the virtual world the weapon effect as it would be seen in the digital twin. Moreover, if the physical environment is fitted with appropriate special effects, the audio and visual weapon effect can be seen and felt in the physical environment. This loop, where actions taken in the physical have an effect in the virtual and vice versa, is termed by 4GD 'IntegratedRealities'. While this example focuses on drones, IntegratedRealities can use any combined arms asset.

synthetic environment which sits inside our SmartFacility. Our vision is that through the blend of virtual and live we can deliver high quality training systems that make targeted improvements to team and individual performances; enhance the ability to respond to various complex situations; and build battle winning capability. All whilst ensuring training is as true to operations as possible and that soldiers train how they fight.

Our flagship SmartFacility is in service with the Army's 16 Air Assault Brigade at Merville Barracks in Colchester. It offers a range of special effects and monitoring features and can be upgraded to also include data capture and analysis, as well as the ACIES synthetic environment which was demonstrated during the Army War Fighting Experiment earlier this year.

This concept is the cornerstone of 4GD's ACIES

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RECOGNIZING, SUPPORTING, ENABLING

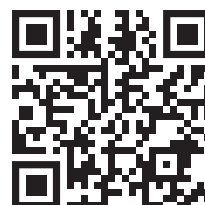
Military Professional Division of Aqualung Group propose **innovative and adapted solutions** for the military and professional market. For more than 75 years, Aqualung Group is pioneering innovations in the underwater industry. Its **Military Professional Division is the industry leading specialist** for best-in-class solutions dedicated to military and professional missions in any water environment. We **recognize** the integral operational requirements of different military and professional End Users and **support** them with premium field proven systems. Our equipment **enables** the End Users to focus on their primary purpose.

Our regulator manufacturing plant, Apeks Marine Equipment, is based in Blackburn, UK. It was founded in 1973 and acquired by Aqualung Group in 1997. There we design and manufacture **world-class regulators and emergency breathing systems** used by maritime military operators worldwide, including UK MoD, and public safety diving units.

We are dedicated to offering much more than just the necessary equipment. For us, it is a true devotion to bring **best-in-class field proven systems and services** that reinforce essential personal safety and enhanced performance for all Military and Professional End Users globally.

We **perform product research and development** as well as test and evaluation scenarios. The analysis machines we have can measure and test equipment performances as well as simulate any underwater breathing conditions. Dive depth, breathing rate, force and water temperature can all be adjusted for higher quality testing. Conscious of the serious environmental challenges military End Users face our nonmagnetic analyzing processes and equipment are at the **highest level**. We are also equipped with a state-of-the art positive pressure cleanroom.

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A Changing Geopolitical Landscape



All areas of the military require to continually evolve in order to meet current and future operational requirements.

Defence diving is no exception and geopolitical tensions and increasingly sophisticated threats are currently driving changes to maritime doctrine and concepts of operation.

At a tactical level, the recovery of a sunken river bridging system or battle damage ship repairs at sea cannot yet be accomplished by machine alone. As a consequence, the need for a manned intervention underwater engineering capability by both armies and navies will remain. However, in the field of naval Mine Countermeasures (MCM) diving, significant effort is being made to remove the 'man' from the minefield by substituting the human with a Remotely Operated Vehicle (ROV) or Autonomous Underwater Vehicle (AUV). As a consequence, the number of specialist MCM divers is predicted to decline and manned MCM 'clearance diving' will in the main, likely be restricted in the future to shallow waters.

With a focus on land operations for the last two-decades, maintaining and developing a maritime Special Operations Forces (SOF) capability

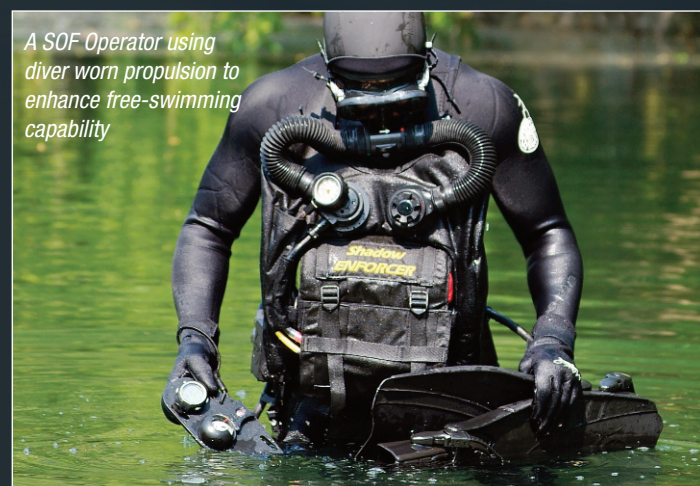
has not been the priority of most Western nations. However, a changing geopolitical landscape has initiated a maritime pivot and numerous nations and military alliances are currently re-structuring their armed forces accordingly. Littoral and riverine maritime activity will therefore increase globally, which will include the expansion of maritime SOF operations.

Modernisation Priorities

The focus on the land activity over the last twenty-years has left maritime SOF with a number of littoral capability deficiencies. Maritime modernisation priorities therefore include but are not limited to: (1) improved lethality & stand-off attack capability, (2) increased Underwater Manoeuvre (UWM) with greater range, speed and operational employment flexibility, (3) signature reduction, (4) sub-surface communications, (5) electro optical sensor systems able to detect, recognise, identify, range and track objects of interest, (6) improved sub-surface navigation, (7) diver thermal protection, (8) extended duration tactical life support systems with increased depth capability and duration, (9) the integration of un-manned surface and sub-surface systems into the SOF maritime battle space and (10) improved situational awareness above and below the water-line. Addressing these capability priorities is requiring significant defence investment and industry innovation. At the User level, whilst these technological challengers are being addressed, there is a transitional effort to return to a 'waterborne' culture within many maritime SOF organisations. As a consequence, technology deficiencies are now being bridged and a stronger special operations maritime capability is being re-established.

Littoral Water Gap Expansion

Increasingly sophisticated land, seabed and airborne sensor / weapon systems are now able to reach deep into the littoral zone, significantly enhancing coastal defences. As a consequence, when facing peer or near peer adversaries, the viability of inserting a tactical diving team by small inflatable craft to within realistically achievable swimming distances of an objective is rapidly declining. In response to such threats, surface or sub-surface SOF insertion support platforms will



require to remain further offshore to mitigate Anti-Access / Area Denial (A2/AD) weapon systems. In addition, the ready availability of highly effective low-cost thermal and low light civilian optical systems notably increases detection potential even when facing non peer adversaries. Crossing the increasingly expanding littoral water gap discretely and covertly is therefore presenting a number of challenges to maritime SOF planners.

To extend the sub-surface range of the tactical diver, SOF will look at creating or expanding UWM capability. As a consequence, increasing use will be made of the Tactical Diving Vehicle (TDV). Whilst such means of transportation is not new, miniaturised precision navigation systems and rapidly evolving high power density battery technology is enabling increased TDV duration whilst reducing submersible craft weight and size. In addition, there will be a trend towards larger multi-man TDVs that can travel long distances on the surface at high speed, run partially submerged to reduce signature or fully submerge for a covert infiltration and exfiltration or threat evasion. Such craft are increasing in sophistication providing the ability to not only transport maritime SOF, but also provide an Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) capability as well as serving as stand-off attack platforms, all of which significantly enhance maritime SOF capability.

In addition to the manually controlled TDV, fly by wire' control systems offer the potential for auto pilot during manned operations and / or autonomous deployment. Increasing use will therefore be made of automation and autonomy where TDVs in 'self-drive' mode can transport a SOF team into the objective area and loiter offshore ready for pick-up. Additionally, an autonomous TDV can be deployed to deliver and recover personnel or to re-supply Operators who remain deployed on or near the shoreline.

Limitation of the Free-Swimming Tactical Diver

The physiological limitations of the free-swimming TD are well understood. A speed of approximately 1 knot or approximately 30m per minute (0.5m/second) is generally accepted as a realistic maximum sustainable submerged swim-speed under operational conditions. If maritime SOF planners assume a sub-surface swim speed of four-minutes per 100m, without any negative or positive influence of tide or current, a submerged infiltration swim of 1,500m may take for example approximately 60 mins. However, placing a small surface diving support vessel such as an inflatable raiding craft within 1,500m of an objective can significantly increase the probability of mission compromise. Due to such a risk, extending the infiltration swim distance can be considered, particularly if the threat level permits a period of surface swimming prior to and post submergence. A combined surface and sub-surface swim of around 5,000m can therefore be expected to be completed under operational conditions by a worked up tactical diving team in full operational equipment. However, tactical swimming on the surface is generally slower than swimming sub-surface, which extends the overall swimming / diving phase of the operation. Therefore, the time to complete a 2,500m infiltration swim (surface & submerged), execute an action on objective and then exfiltrate 2,500m, could take in excess of four-hours. Also, on completion, due to the physical effort required to complete such a mission, there is a reduction in human cognitive and

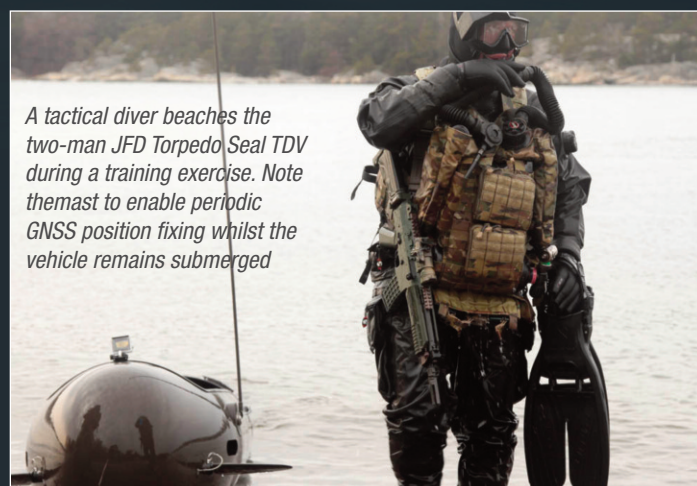
physical performance and thus combat effectiveness. This is an important planning consideration as the tactical diving team at the support craft diver pick-up point, remains in an area of high threat potential and still requires to extract from the Area of Operations (AO).

Extended periods of submergence require other human physiological limitations to be considered and planned for. For example, when using a 100% oxygen Tactical Diving Life Support System (TD LSS), due to oxygen toxicity considerations, as a general guide, the maximum dive time is frequently restricted to four-hours (240 minutes). Dependent upon the time of year and the latitude, a swim / dive duration of up fourhours might consume all of the period of darkness, resulting in other infiltration / exfiltration phases to be conducted in dusk / dawn or even in day-light, which is generally an operationally unacceptable situation. As a consequence, compressing the time spent swimming can decrease the time in the objective area and accelerate the diving phase of the operation. This potentially enables over the horizon insertion / extraction distances to be increased and or better use made of limited hours of darkness, thus lowering risk to insertion and extraction support platforms.

A Tiered Approach to Underwater Manoeuvre Capability

To address the challenges of an expanding littoral 'water gap', a tiered approach to tactical diving and UWM capability projection will increasingly be adopted that will include (1) free-swimming, (2) Operator worn propulsion, (3), one or two-man propulsion devices, (4) two to four-man free-flooding submersibles able to operate submerged or other vehicle types that operate in surface, semi-submerged or submerged modes, (5) six man plus free flooding submersibles able to operate submerged or other vehicle types that operate in surface, semi-submerged or submerged modes and (6) dry submersibles (miniature submarines). As a consequence, driven by mission objectives, threat levels, environmental conditions and geographic locations, maritime SOF will require to move seamlessly between capability tiers.

www.jfdglobal.com



A tactical diver beaches the two-man JFD Torpedo Seal TDV during a training exercise. Note themast to enable periodic GNSS position fixing whilst the vehicle remains submerged

NANUKTM
PROFESSIONAL PROTECTIVE CASES

NANUK Introduces the **988** and Unveils a New Firearm Case

Built on the premise that its waterproof protective cases are nearly indestructible and mobility needs can change over their long use life, **NANUK** create its Configurable Series. Long, deep, rugged, and tough the **NANUK 988** will protect and mobilize loads of gear with room to spare. It's built to go fast with stainless steel ball-bearing wheels and three spring-loaded soft grip handles that make it the perfect premium waterproof protective case to go anywhere.



The **988** is part of our Configurable Series which means it can be adapted to meet changing needs over the life of the product. The base model is equipped with an industry-leading three (3) ultra-strong handles and two (2) large, strong polyurethane wheels with stainless steel ball bearings that make mobility possible on any terrain. If your needs change or if you want to remove weight, the wheel rigs on the **988** are removable and can be replaced by our custom corner caps. The **988T** and **988M** are lighter with no wheels to facilitate team carry deployment and to meet agency restrictions which regulate one-person carry. The **988T** and **988M** also offer a lower profile for efficient warehousing and tight spaces. Both are available as custom orders.

All **NANUK** cases are built with an NK-7 resin shell that's waterproof, dustproof, impact resistant, and lightweight, with rounded corners, thick walls, and oversized details. They're shock-absorbent to prevent damage to the case and, more importantly, to the valuable firearms that they're made to protect. Equipped with patented PowerClaw latches that use compressive force to clamp the lid tight, **NANUK** cases never open accidentally. They're backed with a lifetime warranty, **NANUK**'s assurance that they build protective cases to last.



NANUK 988
4-Up Rifle Case

The **NANUK 988 4-Up Rifle Case** is designed and built to provide firearms the maximum level of protection in custom-made foam and protective case. **NANUK**'s indestructible cases keep weapons and gear secure, and safeguard them from repeated blows, drops, and shocks that happen in the field.

The **NANUK 988 4-Up Rifle Case** is specifically designed to meet different needs of competitive shooters, law enforcement officers, the military, and firearm enthusiasts. The design of the case prioritized the requirements of professionals including protection, fit, versatility, and security.

The **NANUK 988 4-Up Rifle Case** is long and deep and can store up to four (4) AR15 rifles at an overall length of up to 39.75" with different optics installed, including scopes and red dots and everything in between. The case can be locked using the two integrated, reinforced eyelets using two **NANUK** TSA padlocks.

Key features for the NANUK 988 4-Up Rifle Case:

- Interior dimensions: 41.75" x 13.63" x 12.50"
- MIL-STD-810G to protect from the harshest weather conditions
- High-grade custom-cut closed-cell foam to specifically fits popular AR15 rifles
- 3 soft grip strong handles for easy carry and transport
- 2 large and strong polyurethane wheels for easy mobility
- 6 legendary PowerClaw latches to keep the case closed and sealed

Visit nanuk.eu for more info.

SOME THOUGHTS ON TRENDS IN DEFENCE

In and around Summer 2022 Lutra has been getting back into the defence scene at events and seminars as well as continuing to follow events in Ukraine and elsewhere. This has caused us to increase our pondering on what the trends in defence are.

Equipment and doctrine are particular issues as are defence procurement and domination of the airwaves but there are many other issues; integrity, diversity, loyalty being but three. These issues and several others all contribute to the moral fibre of defence so understanding them is mandatory. They are not for discussion here but if you are in or going into defence provision it is worth sharing a few thoughts about them when we next meet.

Many events have shown that the nature of conflict is changing and not just armed conflict either. There have always been machinations of all sorts in areas of ideological, territorial or economic conflict but recently this has become more full on. Thanks largely to the advent of 24 hour mass electronic connectivity and availability, which in itself is a conflict area, the pace and scope of conflict has widened.

Mastery of the ether confers information and intelligence dominance and can be used as a really effective weapon system particularly when combined with selective kinetic systems or activity this contributes to establishing dominance of the “head space” battle or winning the psychological war. The concept is not new. We can all pull up a quote from Sun Tzu, Napoleon or Montgomery to reflect its importance in history. Now it's more important, intense and intrusive. The number of non-state actors acting on behalf of states, but conferring the benefit of deniability, is a relatively new phenomenon. It makes for a complex and much more challenging battlespace.

Perhaps the lesson emerging, or we should say reemerging is the Cold War creed, forgotten during Northern Ireland, Iraq and Afghanistan with our dominance of the airwaves, “They who transmit are dead”, or perhaps not. Being allowed to continue to transmit by the enemy may well be them gaining more destructive power than his resupply trucks usually deliver. The information can allow him to make more surgical strikes and better use of his ammunition to help win the head space battle. Advising on this is a difficult activity. Many people simply do not “get it” and designers continue to produce equipment that shines in the

electromagnetic spectrum as the sun has shone this summer.

The debate about the nature of the kinetic systems required is never ending. A cursory read of the histories of the 1920-30s shows that it has never really changed. Methods of delivering kinetic effect change but mostly they are developments of existing or even historical systems. Analysis of operations and weapon mixes comes up with reasoned argument for this or that solution. Then something happens that changes the basis of the reasoning and confuses the analysts. The need is for multi capable platforms. Some would say that they won't do everything but better to do most of them than nothing which is where we are now.

One theme though is the increasing importance of small unit and specialist operations and activities. Both are areas that suit the British psyche and allow UK to punch above its weight. Equally important is the continued rise in the importance of jointly expecting the unexpected, the improbable usually happens, and preparing for the rise of the unfashionable sectors such as the aforementioned Electronic Warfare and of CBRN.

Some trends, which have been developing for a number of years;

Unoccupied weapon platforms have demonstrated their utility time after time and are here to stay. Perfect they are not but then neither is a section attack. We still need to do them and get better at them. Fuller's Constant Tactical Factor from the 1920-30s will apply and counter measures will be developed but in turn so will counter-counter measures.

Terminal guidance of systems is a must. Mass has its attractions but to have many trucks supporting a massed weapon systems when they can be destroyed or nullified by tactics or a few targeted rounds or devices is a demonstration of the rapier versus the sabre or lance argument. Key to their success; they reinforce the headspace attack and they may produce a cheaper modern effective combat capability. Mass is still needed but it will probably be different.



Small units can achieve effects beyond their size but to do so they need effective lightweight weapons. Lumbering through the night carrying unnecessary weight simply because the financiers don't want to find the money never was a viable option. The excuses no longer hold water because the evidence is plain for people to see. Far sighted financiers have enabled some new weapon systems and equipment as people did during mechanization during the 1920-30s. Far sighted tacticians can see different ways of operating and making the most of opportunities. More needs to be done to facilitate these thinkers, and quickly, if the UK is to keep up with modern warfare and deployment doctrine or better still get ahead of it.

Work with one of our clients, Kromek from Sedgefield in North East England has convinced us, if any doubt exists, that CBRN as a threat remains and will do so for the foreseeable future if not for ever. At the moment the UK is if not on a tightrope as far as capability is concerned but certainly on a balancing beam. The use of CBRN weapons in concentrated force (Syria), surgically (Litvinenko or Salisbury) or psychologically (threats of new missiles etc. in Ukraine) or a ransom chips (Zaporizhzhia) is down to one country but the lessons have not gone unnoticed by many other groups ranging from similar morally deranged or corrupt states (North Korea, Iran, Syria e.g.) to equally morally corrupt political or religious groups (IS, daesh in its widest sense including Hezbollah, to right wing extremists in Germany). There is a real need to drive through re-equipment programmes which take advantage of modern technologies to provide smaller more easily operated data producing, detection equipment such as Kromek's KAPSCAN for Biological Detection or D3/D5 range of RIID isotope identifiers and radiation detectors.

Other work with another client PlastPack Defence (PPD) from Denmark has shown the need for more environmentally sound equipment. PPD have revolutionised the humble ammunition box replacing steel versions with plastic a patented process and design and saving huge amounts of money for their customers' defence and security budgets. Along the way they have conferred considerable operational capability benefits on fighting platforms and units. A multi-faceted win for defence innovation. The number of visitors to PPD's stand at EUROSATORY wanting to discuss these environmental benefits confirmed this. In some countries being wedded to steel manufacture of a product nearly a century old, is considered to be money saving. Their militaries and procurement agencies are out of tune with prevailing economic and social thinking and their bureaucracies afraid of change.

Two of Lutra's client companies are involved in provision of training systems. UK based 4GD who make urban close combat training systems and Survival Systems (SSL) from Dartmouth NS Canada are right on top of their game. Two reinforced messages shine through our involvement with them, greater fidelity and increased stressing of the trainees but in such a way that they see the benefits of the training rather than training for the training. In other words realism is more likely to encourage the trainee to learn, feel better prepared and more confident about facing reality i.e. gaining real benefit and willing to keep training rather than being taught by supposition, text book and rote learning and tick box results. SSL's Modular Egress Training Systems (METS®) have saved the lives of many helicopter and small boat occupants who have faced the ocean in all its might and anger when their craft has crashed or sunk. 4GD's urban immersive close combat systems are training individuals and units to fight in an urban environment, not just as small groups doing room clearances but as recently

demonstrated on the UK AWE programme as manoeuvre forces combining and maximising the systems and firepower of combined arms forces. Part of winning the head space battle.

Defence Procurement has been a vexing issue for ever. However the issues at the moment revolve around the speed at which equipment is procured, the ability to keep the supply network active and the role of SMEs. The three are interrelated so the next paragraphs should be read against that background.

There is no doubt that, certainly in UK, and in other places we know, it takes too long to acquire equipment and this is ever truer with the increasingly rapid development of technology and tactical doctrine. There are 2 elements to this the human and the procedural. The human element is wrapped up in human nature. People don't want to be seen to do wrong, as if they turn up to work to deliberately do so! However there is always the fear of criticism for making the wrong call so better to make no call. The courageous make those calls and are prepared to get it wrong. However as on the battlefield there are few stand out courageous individuals otherwise there would be medals for all. Minimising ones exposure and immersing yourself in the minutia of day to day work and procedures is usually not criticised in a bureaucracy. In procurement by doing so you endure no personal criticism but paralyse delivery of much needed programmes.

Procedurally the one size fits all approach to procurement is an appalling approach to running a large organization. Insiders say "that is not the way it is" but to those on the outside the laborious processes seem ridiculous. Would you carry out a cyber assessment when buying a washing machine? Probably not but the MOD does. There has to be better ways of being involved in defence procurement. Again insiders say there are but the length of time it is taking to get to the point where those procedures emerge is as long as that for buying some of the equipment. Moving more quickly, making more money available for equipment as a result, will keep production lines and therefore the supply network full and working for longer which contributes to resilience and self-sufficiency.

The process does not encourage Small and Medium Enterprises, the well spring of: innovation, initiative, productivity and industrial drive by British Industry, into defence. An attempt to entice them in or improve their lot in the Defence contracting world is caught up in the procedural morass referred to previously. It must be an aspiration to get out of the morass soon before more money is wasted by industry (and therefore the government because earnings and taxation are reduced, as less capability is available or delivered), having to churn through the time consuming bureaucratic morass of the projects and the process. Those in the swamp must be getting close to the edge by now. One hopes they will be on dry land soon and able to run free and pull industry along with them rather than making the liquid in the mire muddier and smellier.



www.lutra-associates.com



DON'T BRING A “KNIFE” TO A SPECTRUM “GUN FIGHT”

The contested spectrum environment along NATO's operational edge can be extremely complex and having the right kit to adequately capture signals of interest is paramount.

Even more, the ability to share data with allies and partners, including civil agencies, grows with hast.

Yet, many militaries place their spectrum managers at a disadvantage, underequipping them for the mission at hand, or in other words handing them a “butter knife” (aka a handheld spectrum analyzer) when they really need permanent or semi-permanent 24/7 fixed monitoring



“saber”. Couple the butter knife with general manpower shortages; the ability to scan and sense the electromagnetic spectrum becomes a daunting task. CRFS, with our multi-mission, multi-user, multi-mode approach can and has rapidly filled this critical gap for spectrum managers, adding more “firepower” to their arsenal while decreasing manpower requirements through automated scheduling. Our flexible systems, such as our RFeye Nodes reach bandwidths up to 40GHz, while still easy to deploy and network within our STORMCASE or Mini-Outdoor Kits.

Leave the Hobbyist SDRs for the Radio Club

With the threat so large, and long lead times for promised programs of record, many spectrum managers are turning to the growing market of quick-to-buy hobbyist SDR spectrum analyzers. Normally under \$500, these are great for radio enthusiast community, however their limited bandwidth and frequency range, at most 20MHz and up to 6GHz, just aren't cut out for tactical operations against complex frequency hopping radios. Additionally, associated software for SDRs is very limited and doesn't output data in formats that can be uploaded into military/intelligence databases or are in line with ITU standards.



The Last 100 Yards is just that...

Another issue concerns the old habit of spectrum managers using handheld spectrum monitoring systems (e.g wands/spades) for wide/area monitoring, systems that are really designed for localization within the last 100 yards. While these devices incorporate high quality receivers, they normally only provide limited IQ streaming bandwidth (5KHz up to 20MHz). Storage limits are also an issue that must be considered, as most show spectrum only in real time. In addition, handheld receivers require manpower to operate them, and if an operation is running 24/7, this can place stress on the EW troops due to watch rotations and the vast area of operations. As explained before, spectrum managers are attempting to do more with less and therefore missing out on spectrum events that occur when their SDRs or handheld systems are not manned. With only limited number of spectrum managers per unit, it is easy to see how this problem expands.

Flexible, Fixed/Expeditionary Systems fill the Gaps

CRFS tackles these problems head on, providing flexible, deployable, and accurate spectrum management systems that increase capability and decrease manpower. Our RFeye Nodes start at 9kHz and run up to 8/18/40GHz, with seamless antenna transitions. Packaged in either IP67 Outdoor Kits or in man-portable STORMCASEs, spectrum managers can quickly setup 24/7 expeditionary monitoring, networking the Nodes so that multi-users can run spectrum missions. Think about it, while one spectrum manager at headquarters is doing occupancy reports, a forward deployed EW soldier can hunt for signals of

interest and triangulate them using TDoA. Our Mission Manger software enables task scheduling and reporting, including TDoA missions. Backhaul is simple, and power is easy, with STORMCASEs able to hot-swap 5-hour MIL-SPEC lithium batteries and other nodes running on POnE or DC. For those looking for expanded I/Q data streaming, CRFS has recently launched the SenS Remote, using fiber and a headless RFeye Node to push out 100MHz instantaneous bandwidth and includes customizable storage options for capture over hours/days.

Interoperability in Spectrum is Growing

Once deployed, CRFS systems easily integrates with NATO by pushing out track data in ASTERIX ATC format (codified as a NATO standard within STANAG 5535), and spectrum data through TCP/IP and CSV files. IQ files can also be saved as XDAT, WAV-E and other common formats for ingestion with partners or even civil authorities. CRFS's experience providing solutions to both civil and military users ensures we can close the capability gap, promote interoperability, and increase lethality. Enables spectrum managers to carry just more than a knife to an electromagnetic gun fight. For more info on CRFS solutions, please visit us www.crfs.com.

www.crfs.com

CRFS

THE ENVIRONMENT MATTERS



PlastPackDefence

and it Matters to Defence, Defence Economics and Defence Capability

The recent Eurosatory exhibition confirmed to the Danish Company PlastPack Defence (PPD) that the simple statement that The Environment Does Matter and it Matters to Defence is both true and very much a topic in defence planners' minds. War and conflict, which all Western, and likeminded, countries plan and equip to avoid and deter, is when it happens environmentally disastrous, but that is no reason not to do every reasonable thing in our power to prevent defence equipment, training and use being environmentally ruinous especially if it can be turned to advantage.

So called "green defence" is already showing that a few simple measures can have considerable financial and operational benefits. Part of this is that non-traditional and often nonlinear thinking results in different equipment options and operational concepts. The other part of green defence is that different materials and practices are just more economic and less demanding of equipment. People and the environment.

PPD have long realised this but it was comforting to them to see the flow of policy makers and users visiting their stand to discuss the benefits of their products. Having long been in the packaging industry the owners and executives of PPD along with their design and technology partners are steeped in civil standards and environmental best practices for design, manufacture and use of packaging materials and techniques.

The central supposition of PPD's packaging solutions is that weight costs money and uses energy and therefore saving it saves money, energy and therefore the environment. This simple truth runs slightly

counter to existing defence planning thought where change is not necessarily good because change mean new processes and new methodologies. Thus the longer one can hold onto an embedded position the less cost there will be.

The reality is that holding on to an embedded position usually involves unnecessary expense and the longer you hold on to that position the more money you waste and the less there is for projects and programmes that enable you to become a leaner, meaner more effective deterrent to conflict. Seen from the outside any programme that is essentially the same as a product designed and first issued in the Second World War has to be, at best, long in the tooth if not well past its sell by date.

How then do PPD save money and improve operational capability for the armed forces (and for that matter the police, outdoor sports people specialist equipment manufacturers and the like)? Simply put where there is steel being used in packaging replace it with specialist plastics. The target of this radical change: ammunition packaging cases.

The current family of ammunition packaging cases has been around since 1941 and whilst their initial entry into service made military logistics much easier and contributed to ammunition safety in a major way they have also had plenty of opportunity, readily accepted, to consume defence money. The onset of the PPD Light Weight Ammunition Case (LWAC) has essentially put in place the mechanism to stop this colossal waste of money and coincidentally reverse several decades of underperformance by defence platforms.

Looking at the bare facts is instructive. The most commonly used ammunition case is the M2A1 (or M or H 83 in UK service). The LWAC and M2A1 (used synonymously for M83 from now on) has a set of testing rules to show how good it was/is at protecting and promoting ammunition safety. These grew up in the mid Second World War and have proliferated since. The trouble is that many of these are not based on either fact or science but are random selections of tests that could be applied.

One such is a requirement to protect against fires of a certain temperature. The test was designed to show metal was better than wood for storage and protection. The fact is that at that temperature





the propellant in the ammunition will already be on fire and rapidly turn the M2A1 into a very effective bomb which will cause sympathetic fires, causing rounds to “cook off” and scatter burning rounds and shards of metal and larger pieces of the case as shrapnel all over the place causing collateral damage to the platform (ship, aircraft or vehicle) and unnecessary casualties to the people trying to deal with the situation or evacuate the problem area. Plastic merely melts, a few rounds will cook off and the remaining ones will fall to the floor.

What therefore are the operational benefits? Remember weight is the enemy and an empty LWAC has a mass of 780 g, 68% less than an M2A1 at 2500 g. When packed the mass of an LWAC is 10% less than an M2A1. Look at that from a carriage point of view. It is an extra layer on each pallet equivalent to one more pallet per 6 t truck. More ammunition per given number of trucks or less logistic trucks in the combat area increases capability or reduces vulnerabilities and casualties.

The saving read across to armoured vehicles having longer ranges. On Danish Army PIRANHAS that equates to a saving of 163 kg and an additional 450 km of range and even fewer trucks in the combat area. Wars are won and lost by logistics. It seems plastic LWAC may be a war winner.

Aircraft particularly combat helicopters have greater endurance, typically 30-45 mins longer in USMC studies or carry more ammunition. Battles are won by being able to shoot for longer or more often so the endurance/ammunition quantity equation may well allow LWAC to win the battles that help to win the war.

Plastic LWAC do not make the same amount of noise as steel M2A1. Resupply at night is quieter and more secure which reduces vulnerability. The reduction in logistic casualties as logistic transport is reduced is supplemented by the reduction in collateral injuries caused to veterans' knees and hips in later life and back injuries to serving soldiers. Treatment and management of these post service comes from the defence budget.

Strategically reduced weight means reduced logistic haul over logistic routes. Thus the Danish Airforce were able to calculate that in 2010 by using LWAC as opposed to M2A1 they would have saved

€1,140,000.00 in fuel charges alone supporting their battalion in Afghanistan. Add in the aircrew costs operating costs and support costs of fewer aircraft and the saving have a direct, and dramatic, impact on the cost of overseas expeditionary operations.

Including RFID tags in the cases means accounting is easier. Less counting requires fewer people. More cost savings and much greater efficiency.

Against all this less vehicles moving less often has dramatic pollution benefits across defence. In addition to less pollution there will be less overhead costs, less support costs with fewer troops, barracks and training costs.

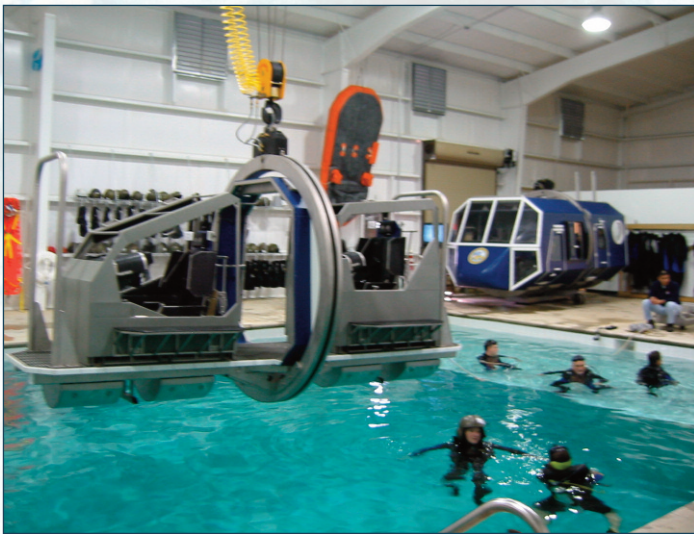
The environment does matter and it matters to defence and defence economics and capability. Showing you are prepared to make changes to the operating model will win friends amongst, or at least placate, the wokeish and very environmentally conscious youth of the Western World convincing them to support defence in the increasingly troubled environment we live in. Hanging on to a Blimpish belief that what was for our forefather an advance still holds true is no longer an option. The operational and environmental benefits of green defence mean one generation's advance is a millstone around the neck of the next.

ppddk.dk



MODULAR VERSATILITY, FIDELITY & SPECIALIZED TRAINING SCENARIOS

Halifax Nova Scotia Canada based Survival Systems Limited (SSL) provides safety training equipment related to overwater operations, usually maritime situations. Primarily associated with helicopter safety training SSL's Modular Egress Training Simulators (METS®) also address: fast jet, fixed-wing, small boat, amphibious and land-based vehicles.



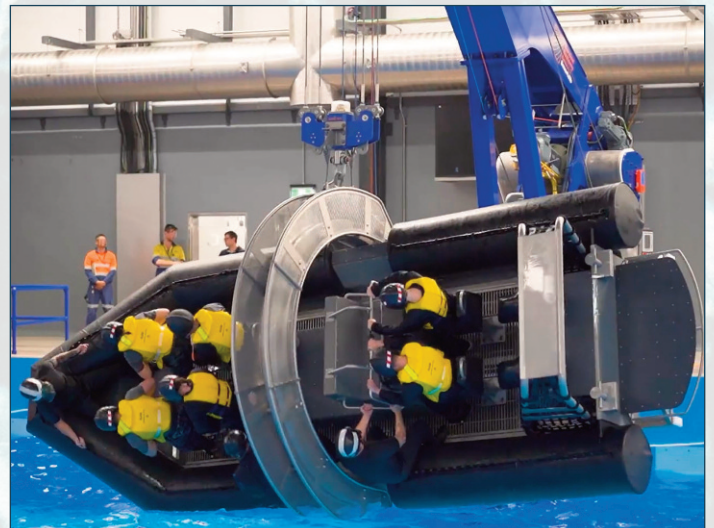
The Company also provides design and engineering services for Survival Training Simulation Theaters (STST™) that encompass realistic training scenarios through use of Environmental Training Aids which allow students to practice newly acquired survival and rescue skills in a realistic storm settings.

Underwater egress training comprises a series of challenges faced by the incumbent including: surviving the incident; egressing the airframe, boat, or vehicle; then surviving the elements. It is very common that these challenges are faced in a night time, hostile environment. Experience has shown training in controlled simulated conditions that replicate such an environment raises the probability of survival exponentially. Using a high-fidelity simulator that replicates the aircraft, boat, or vehicle in training exercises develops a muscle memory reflex that is also imperative in successful survival.

The word modular is used advisedly as will be seen but the guiding principles of SSL's approach are safety; training outcome reliability;

fidelity to real aircraft and situations; longevity of systems giving real whole life value; flexibility and support to clients, operators and end users, (three distinct branches of the "customer" who often do not interact with each other well). Whole life is key to SSL's philosophy which is not a quick buck approach with a race to the bottom on price and quality so often valued by short term consumers and favoured by commercial decision makers who often forget that people lives are at risk at sea and in the training pool. Rather SSL's purpose is: "To enhance and preserve workers' lives through safety education, training technologies, and applied research and development."

R&D is the backbone of SSL's technologies and related training programs. After training in a METS®, testimony from survivors of actual ditchings is proof that simulated fidelity to the real craft in training delivery is instrumental in survival. The effectiveness of this has been shown in a recent design review of one aircraft where the positioning of seats needed changing because in a stress situation seat occupants next to emergency exits could not operate the exits despite the drawings





and specifications saying they could. This collaboration with aircraft designers is another key aspect of SSL's approach to safety, which it treats holistically, not as compartmentalised procedural tick box exercise. Further research has shown:

The necessity of exposing students to lifelike scenarios so they become trained to escape under tension.

Fidelity to the real aircraft so trainees encounter obstacles that cause real and genuine problems to overcome such as they would face in actual mishaps.

Emphasis on making the training as safe as possible so it is not feared but rather seen as an aide to survival, not something to be trained for in its own right.

Training for dangerous activities is in itself dangerous; making it more dangerous than necessary is less than sensible.

When sticking to the creed of best value and cost effectiveness whilst designing METS® variants, key factors are:

Making best and cost effective use of facilities and staff, reducing operator costs.

Maximising throughput of trainees so that time away from other duties and tasks are minimised, reducing user costs.

Minimising the need to purchase additional METS® so capital expenditure is reduced. Minimising the number of units also reduces storage space thus also reducing capital facility expenditures.

In a previous paragraph modularity was mentioned as a key design aspect. SSL realised that if expensive components of its METS® could be standardised, replaceable parts could be deployed to customise the METS® to different aircraft or craft types. By doing this many of the key factors of SSL's design philosophy and provision of best practice could be satisfied. By adopting modularity, a medium or large aircraft can be changed from for instance a MERLIN to a PUMA in a short period of time by two SSL trained METS® Technicians.

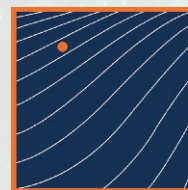
There does though come a time and a situation where the requirements of modularity and fidelity crash head on. In these circumstances fidelity

wins and a specific METS® must be designed but still based on the same creed and purpose. In essence these applications often revolve around specialist helicopters such as Apache, Mangusta and Tiger or specialist watercraft. The same drive for training and operational safety and student throughput is key.

However there are so few of these units around and given SSL's determination to provide best value for money longevity and thus best through life costs the basic chassis of the systems have an operational life measured in decades and they are frequently repurposed from one aircraft type to another. When being repurposed new panels and ancillaries are fitted to make the METS® match the equipment entering service.

This is where SSL's strict maintenance and inspection policy comes into play. By ensuring that SSL, as the OEM, carries out regular maintenance on in-service units the users are assured no defects occur through life, allowing repurposing to be safely carried out even transferring the units from one user to another. Regimented servicing also ensures the latest safety measures are incorporated into these specialized METS® during their extremely long operational life.

It goes without saying that SSL's Modular Egress Training Simulators (METS®) are keenly sought after. If and / or when they come out of service with one country or service a sensible economic model allows best use to be made of available funds to either lease or purchase repurposed units. This approach applies to other METS® variants in addition to those that replicate helicopters; e.g. Rigid Hull Inflatable Boats, Amphibious and land based vehicles. It's all part of the same commitment to value, safety of human life and giving operators the best chance of surviving catastrophic events by allowing training to be carried out in the safest possible conditions.



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Systems
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Maintaining wheeled vehicle mobility with **TYRON** Runflat

In September at DVD 2022, Tyron Runflat will highlight its innovation in developing new runflat solutions and supporting requirements from new and existing customers.



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As part of the range of new systems - including new independent suspension systems, upgraded driveline, steering and braking systems, central tyre inflation systems (CTIS) and increased diameter tyres – the vehicles will be fitted with Tyron's complete wheel assemblies consisting of its All-Terrain Rubber Multi-Piece (ATR-MP) runflats, wheel and the Michelin X Force ZL16.00r20 tyre.

Initial deliveries were made back in early 2021 and the programme highlights continued demand for increased mobility and safety for military vehicle fleets; and reflects the wider trend among armoured vehicle users who are looking to maximise the utility of existing fleets by applying tried and tested technology to enhance flexibility and capability for current and emerging operational theatres.

Tyron's ATR-MPs will contribute to increased mobility and safety for the vehicle fleet, while also supporting simplified logistics in the field.

"As the ATR-MP is a multi-section runflat, it does not require any special tools or a hydraulic press to insert and remove the runflat when replacing the tyre, meaning it offers a huge advantage over single piece systems that require both of those things," Peter Simson, Director, Tyron Runflat, said. ***"In fact, in many cases when a single piece runflat needs to be replaced following a tyre strike they have to be flown to another country where bases are equipped to handle the repair. This means vehicles and their crews may endure significant downtime whilst repairs and replacements are sourced."***

Tyron's All-Terrain Runflats are designed to give a wheeled vehicle with one or more tyres deflated the potential to continue to manoeuvre to a place of safety, over any terrain. The runflat guarantees beadlock, which prevents the tyre spinning on the wheel when deflated, enabling the vehicle to continue moving at speed in full compliance with on and off-road Finabel standards. The system is also fully compatible with CTIS and standard wheels, maximising its flexibility for the military market.

Building on success

The company's newest innovation, unveiled in June at Eurosatory, is the new All-Terrain Rubber (ATR) EasyFit. The new solution is designed to sit between Tyron MultiBands and full ATR-MP and ATR-SP all terrain rubber runflat systems currently supplied widely into the defence marketplace.

The new ATR-EasyFit aims to fill a significant gap in the market for lightweight rubber runflat solutions on light armoured vehicles on 16" wheels right through to 22.5" wheels used on military and commercial logistics vehicles.

"Lightweight 4x4 vehicles with standard wheels are used for multiple critical military and security applications including special forces, border guard and small logistics vehicles and trailers," Simson said. ***"Many of these vehicles are operating with no protection against tyre strike, leaving the occupants at risk following a tyre strike or blow-out."***

"The ATR-EasyFit is designed to give these vehicles a low-cost, simple to install safety boost that allows vehicles to keep moving following tyre deflation or puncture so that they can return to base safely."

The option for vehicles of this type was previously limited to MultiBands or full, multi-piece runflat systems. The ATR-EasyFit provides a new cost-effective option for this vehicle profile, combining the mobility advantages of the multiband with the shock-absorbing benefit of rubber runflats.

The system has a steel core for strength, with a rubber outer that gives protection against kerb strikes, road debris and uneven terrain. It is based on a carbon ratchet system to reduce weight, and its preconnected cabling design allows it to be fitted without specialist tools and equipment for simple fit and removal in the field.

The ATR-EasyFit offers a 50km runflat capability, allowing the vehicle to maintain mobility during and after a tyre strike event and continue moving to a place of safety with one or more tyres deflated.

For more information on the range of Tyron Runflat solutions please email: peter@tyron.com

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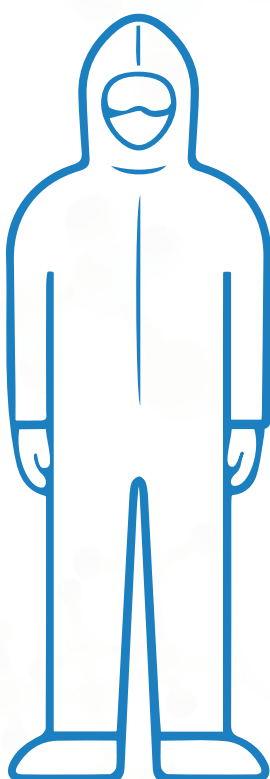
Alongside significant business growth for the company in the Baltic region, demand for its full military runflats remains strong among its existing customer base. In January this year the company became the first supplier in the UK to begin deliveries of complete wheel / tyre / runflat assemblies using the new Michelin X Force ZL16.00r20 tyre. The deliveries are part of the company's work on the NP Aerospace-led programme to upgrade the British Army's Ridgback and Mastiff vehicles under the UK Ministry of Defence's (MoD's) Protected Mobility Engineering & Technical Support (PMETS) programme. The team at NP Aerospace are upgrading vehicles by installing an industry leading package of equipment that significantly improves their off-road mobility, as proven by the teams at Operation NEWCOMBE in MALI.

The work is being carried out in order to enable the heavy armoured vehicles that make up the Army's protected mobility fleet to operate in challenging operational terrain and keep British Army soldiers safe on deployment.



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	CWA PROTECTION	BREATHABLE	AIR PERMEABILITY	WEIGHT BURDEN	HEAT BURDEN	AEROSOL	FIRE RETARDANCY	ANTIVIRAL
KESTREL	High	High	High	Low	Low	High	High	None
FALCON	High	High	High	Low	Low	High	High	None
PHOENIX	High	High	High	Low	None	None	High	None
KITE	High	High	High	Low	Low	High	High	Low
CETAN	High	High	High	Low	Low	High	High	None
VIPER	Low	Low	None	Low	High	High	None	High
OSPREY	High	High	High	None	None	None	None	None

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Peli BioThermal's patented Golden Hour™ technology

There's good reason Peli BioThermal's patented Golden Hour™ technology received the U.S. Army's Greatest Invention Award in 2003.

Prior to this, there was no effective container to safely transport critical blood to troops fighting in far forward combat areas away from fixed medical facilities. That fundamentally changed when we invented Golden Hour technology — aptly named because it provides troops access to the whole blood, platelets or plasma they need to save lives during the critical first hour after injury.

This innovative thermal transport container protects the products you need no matter the location or extreme conditions on the battlefield. For the last 17 years, military personnel have trusted our technology to securely, reliably and safely transport pharmaceuticals, tissues, biologics, diagnostics, vaccines, blood supplies and more from anywhere in the world — to where they need it most.

The award-winning Original Golden Hour™ technology was developed to protect troops' lives on the base and on the front line in the harshest of environments and climates. Today, Peli BioThermal's packaging solutions provide the most reliable, longest temperature control duration on the market — 96 hours of thermal protection. Life-saving materials are housed in smaller, lighter weight, rugged and durable temperature controlled Credo™ shipping containers without the need for dry ice or water / gel packs.

PELI BIOThERMAL PROVIDES:

- A full range of single use and reusable temperature- controlled packaging options that cover the full range of the military's needs — chilled, frozen, controlled room temperature (CRT).

- Optimised payload ratio that reduces distribution costs by minimising outer dimensions and maximising interior payload capacity with 100% available for product.
- One hundred percent recyclable components that reduce your impact on the environment.
- A web-based asset management software solution (Credo ProEnvision) to track individual shipments around the globe, set up automatic maintenance, next shipments alerts and produce customisable reports.

OUR PRODUCTS:-

Golden Hour™ Mobile

Also known as the Original Golden Hour™, this product is the foundation stone of our business and the Winner of the 2003 "US Army's Greatest Invention Award".

WHY SELECT GOLDEN HOUR™ MOBILE?

- Ease of use — modular design for quick assembly and efficient inventory storage
- Nimble and tactical for delivery of whole blood to the point of injury within a crucial window of time
- Designed and tested to last in the harshest conditions.
- Quality, durable construction

Temperature ranges - +2C to +8C, +15C to +25C

Volume -2L

Duration — 48 to 72 hours



Golden Hour™ Medic

A recent addition to our range, the Golden Hour™ Medic is a nimble and tactical option for delivery of whole blood to the point of injury within a crucial window of time and can be easily transported to the front line. Golden Hour™ Medic replaces traditional cumbersome containers and can keep 2 units of blood cool for up to 24 hours in extreme conditions, 3 days in optimal conditions.

Credo™ Cube

Superior thermal protection in a convenient mid-size container. The Credo Cube™ is a passive and reusable shipper qualified to hold chilled medical materials at a safe temperature for up to five days. This system is ideal for reducing shipping costs or for circumstances in which unexpected delays may occur. Available for volumes from 2L to 96L, frozen, chilled and ambient temperature profiles. Also available with a hard, impact-resistant outer shell – Credo™ Duracube HD

Credo™ Duracube HD

The Credo Duracube™ product line offers a selection of superior thermal protection in a comprehensive range of lightweight and heavy duty hard shell outer containers (between 2L and 96L) designed to strike an optimal balance between case weight, durability and duration of transit capabilities while providing a 10-15% increase in thermal performance over outer corrugated material. Available in frozen, chilled and ambient temperature profiles.

Credo™ ProMed

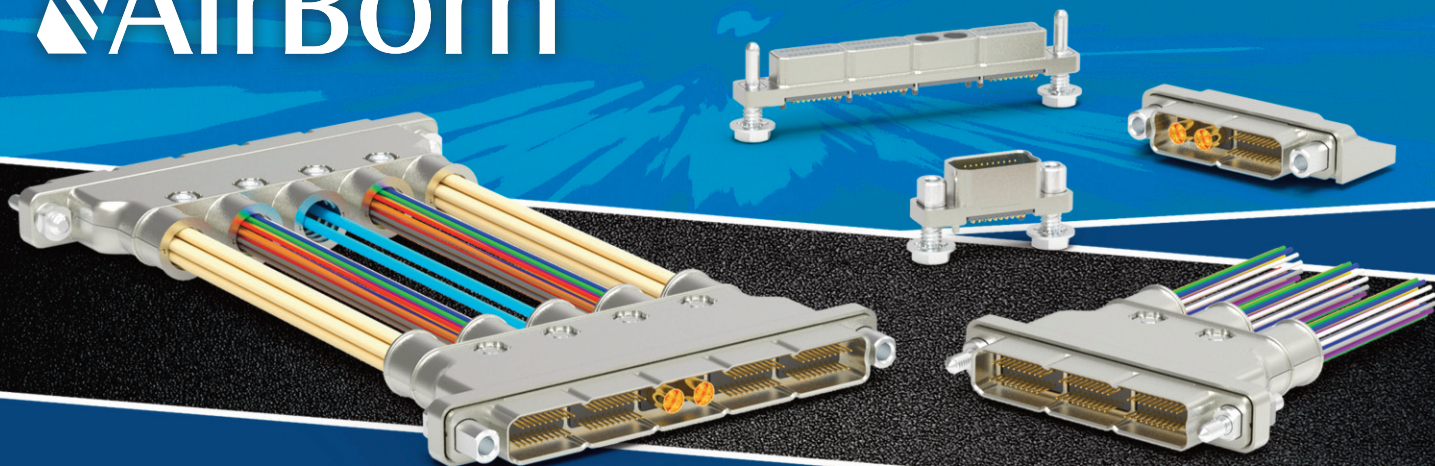
Designed specifically for the dynamic needs of emergency first responders, the Credo ProMed™ product line currently consists of three different sized temperature-controlled portable medical transport bags that thermally protect the integrity of valuable pharmaceuticals and medical supply payloads for 72 - 96 hours. The outer bag is constructed of highly durable ballistic nylon fabric and the patented TICTM panels with phase change material and VIP components contained within, are qualified to consistently protect medical materials such as blood, platelets, bio-pharma product samples within two ranges, chilled and ambient

Credo™ Xtreme

This high performance, extremely durable and reusable passive temperature controlled pallet shipper is offered in two sizes (371L and 807L) and is ideal for consolidating large domestic and international cargo shipments. Peli BioThermal's Credo™ patented technology provides a revolutionary cost effective temperature-controlled pallet shipper that ensures secure transport of bulk pharmaceutical products – qualified to maintain the required temperature range for 120 - 144 hours. Easy removal and installation of the TIC™ (PCM) system, greater volumetric payload size and a reduced risk of product compromise.

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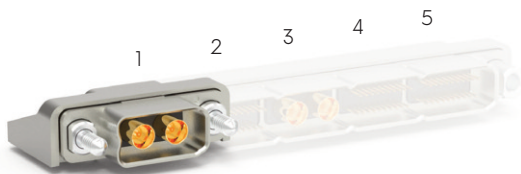
New! SlnERGY®

Modular Interconnect System

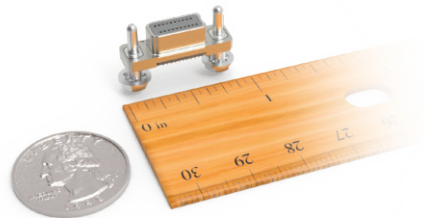
Small, Modular, & Fast with Speeds up to 25Gbps!

Introducing AirBorn's Slnergy family of connectors! Slnergy offers OEMs a mini-modular hybrid solution configured in 1-5 distinct bays. Exemplifying mil-grade resilience, this high-speed, high-density connector is tested & qualified to MIL-DTL-83513 requirements.

Ideal for Mil-Aero, Space, & Industrial applications, Slnergy's 4 points-of-contact can handle a very rough ride. Configure Slnergy with interchangeable locking, jacking, or guide hardware and SMT termination. Customers have relied on AirBorn's quality and innovation since our inception in 1958.



Multi-bay, die-cast metal connector system with interchangeable molded insulator bays.



1 and 2 bay Slnergy models are roughly the size of a U.S. quarter — similar to Micro & Nano Ds.



SMPM RF interface (.173"/4.39mm) available in cable & board-mount configurations.



Vertical & right-angle board-mount connectors. Discrete Wire, SMPM RF, & Twinax cable assemblies.

Ready to learn more about Slnergy? Register for the September 14th webinar!



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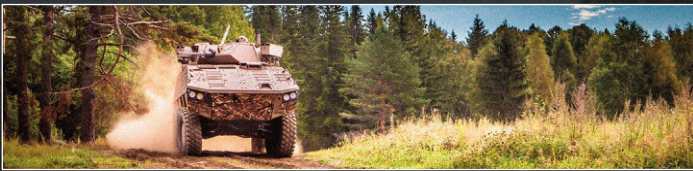
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SCHROTH®**Mine Blast & Utility Seat Systems**

The **SCHROTH Mine Blast Protected Seat Systems** are tubular lightweight systems with a unique resettable Energy Absorbing (EA) system designed into the seat.

The EA design and technology comes from the years of experience **SCHROTH** has with energy management in seatbelt systems. The design of the seat gives the occupant not only excellent protection in a mine blast event, but also offers excellent protection in the event of an accident or impact. The All Belts to Seat (ABTS) design allows the vehicle manufacturer to optimize the installation of the seat within the hull. An integrated footrest can also be incorporated into the seating system for additional lower-leg protection. The unique **SCHROTH EA** technology is tunable to match the size and weight of the vehicle as well as the level of protection required and the available space within the vehicle interior. The EA is also designed to reset itself and offer high levels of protection for the secondary (slam down) event.



The Mine Blast protected seating system is available in two versions:

- **SU-62 compact forward- or rear-facing seat**
- **SU-63 side-facing seat with full or side specific headrest for exceptional side impact protection**

The **SCHROTH** seating comes standard with an ECE certified lightweight 4-point harness restraint. Restraint systems with ECE complaint 5-point seatbelts are also available.

SCHROTH offers the ideal system for military personnel & troop transport configurations.



KEY FEATURES

- Quick release, wall-mounted interface
- Modular construction
- Spring Loaded Self-Folding, storable seat pan
- Foldable backrest

CUSTOM APPLICATIONS

Our lightweight seat systems may be adapted to many ground vehicle applications. We can assist with interface, integration, installation and ergonomic requirements as well as any vehicle specific seat modifications that may be required.

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