

DEFENCE PROCUREMENT INTERNATIONAL

Winter 2025

25 YEARS OF BOXER



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BATTLEFIELD DRONES**

**DEFENCE TECH
INVESTMENT SURGES IN
DRONE WARFARE**

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Magazine cover: Lithuania's BOXER infantry fighting vehicle, known as "Vilkas", successfully completed Live Fire Testing in February, 2024 (Photo: OCCAR)



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I cannot remember a time when defence start-ups have piqued the interest of investors and Departments of Defence so much. The war in Ukraine and rapid advances in unmanned systems and artificial intelligence have cast a searing spotlight on start-ups producing technologies at the “bleeding edge” of defence R&D. On page 70, we talk to three drone start-ups — two who emerged from the fog of war in Ukraine, with founders from Lithuania and the UK, and Israeli drone company XTEND, one of the biggest drone companies in Israel which emerged from the world of first-person-view drone racing to develop software-driven precision strike and tactical drones for Israel's Defence Forces.

The wars in Ukraine and Gaza have sped up everything for these companies — sales cycles, tech development and financing. War changes everything. Even once reluctant venture capitalists wary of defence's long sales cycles and the risk that it may not tick all the boxes when it comes to ethical, governance and sustainability considerations, say there is no other option but to invest in new and innovative technologies that could give soldiers a winning edge on the battlefields in Israel and Ukraine.

Defence primes like BAE Systems and Lockheed Martin are also getting in on the action, snapping up innovative companies like Malloy Aeronautics, a British company specialising in heavy-lift unmanned aerial vehicles, and Vatn Systems, a start-up specialising in autonomous underwater vehicles. On page 77, Tom Rowe-Jones from LAVA Advisory Partners, explains why defence M&A has shifted from consolidating traditional capabilities to acquiring “cutting-edge” technologies.

Despite investors new-found love for defence start-ups, small and mid-sized defence companies in Europe are struggling to access working capital to grow and expand their business. One thing stands in their way —

banks' and investors' strict interpretation of regulations such as the European Union's Green Taxonomy, which classifies activities that are 'green' and support the economic bloc's net zero climate ambitions.

However, with President-elect Donald Trump preparing to enter the White House for a second term, pressure on the EU to scale up investment in defence will ramp up significantly in the coming months. Can Europe's defence industrial base make itself more attractive to investors who question its sustainability credentials? Check out our article on page 14, which outlines what steps companies can take to reassure banks and investors.

In our land systems section we go behind the scenes of one of Europe's most successful vehicle programmes, the BOXER 8x8 multi-role armoured vehicle, which celebrated 25 years in December. OCCAR, which oversees the procurement of the vehicle for four countries — Germany, the Netherlands, the UK and Lithuania — knows a thing or two about delivering vehicles — more than 1,350 of them so far, including 19 different variants. Although the programme suffered setbacks early on, with France and the UK leaving (the UK later rejoined BOXER in 2018) to pursue other designs, the vehicle is a rare success in defence co-operation among countries with different operational requirements.

We also pay a visit to Allison Transmission's factory and Customer Experience Centre in Hungary to get the inside track on why two-thirds of all wheeled combat vehicles currently in production in EMEA use its transmissions. ■

Happy reading,

Anita Hawser
Editor

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Defence is not explicitly defined as an ESG-compliant activity, which creates a policy paradox (Photo: Eurosatory)

FINANCING HURDLES FOR DEFENCE COMPANIES AMID ESG PUSH

How can Europe's defence industrial base make itself more appealing to banks and investors who question the sector's green credentials?

By Giulia Tilenni

2014 was a decisive period for defence expenditures in Europe. Triggered by the Russian annexation of Crimea, that year, NATO members committed to devote at least 2% of their GDP to defence spending.

Meeting this objective, however, proved challenging. A decade later, the EU's average rate of defence spending remains at 1.97% of GDP. Responding to threats from Donald Trump in his first term as US president to disengage from NATO and European allies, Europe accelerated efforts to reinforce its defence industrial base.

Yet, with many defence projects in the EU being cancelled, modified or postponed, the associated drop in demand had a severe impact on supply. 2022 saw EU defence spending and investment, which reached €240 billion, recover. According to Jiří Šedivý, chief executive of the European Defence

Agency (EDA), EU member states are projected to spend €300 billion on defence in 2025. However, Russia's full-scale invasion of Ukraine in February 2022 demonstrated that the political and economic efforts made in the last decade to revamp European defence were insufficient to compensate for the previous decades of underinvestment. The political promises that most EU capitals made to Kyiv clash with empty inventories across European armed forces and defence companies' inability to speed up the production rate to meet delivery deadlines.

So far, largely US aid to Ukraine has allowed it to contain Russia. But with president-elect Trump taking office in the new year, the situation could dramatically alter in 2025. Trump has vowed to end the war in Ukraine and is expected to reduce the flow of US military aid and equipment to Ukraine. He has also reiterated calls for NATO members to raise their defence expenditures to at least 3% of GDP, although recent media reports suggest it could go as high as 5% of GDP.

The situation presents challenges for EU member states and Europe's defence industrial base. On the one hand,

governments want to replenish depleted weapon stocks or speed up aid deliveries to Ukraine. On the other hand, the challenging economic environment has put national procurement at stake, raising companies' uncertainty over continued financial support from their respective countries.

Although major European defence contractors such as Rheinmetall, BAE Systems and Leonardo have seen profits rise substantially from new equipment orders following Russia's full-scale invasion of Ukraine, many small and mid-sized players face difficulties accessing public and private finance.



The political promises that most EU capitals made to Kyiv clash with empty inventories across European armed forces (Photo: Eurosatory)



Delegates at the French Army's stand at Eurosatory 2024 (Photo: Eurosatory)

A joint statement issued in November 2024 by EU defence ministers says financing for Europe's defence and industrial base is increasingly impacted by a trend among investors to apply increasingly stringent environmental, social and governance (ESG) criteria, which excludes companies in the defence and armaments sectors.

"This has wide-ranging consequences for the defence industry such as limiting the number of potential institutional and private investors, damaging its reputation, and making it harder for the industry to attract talent," the ministers' joint statement reads. Decreased access to finance also impacts SMEs ability to scale and finance R&D, "thus pushing them away from the defence market, which is reliant on innovation", said EU defence ministers.

Šedivý of the EDA accused European financial institutions of taking an "activist stance" against European defence

companies. "We cannot accept [this]. Strong defence is a pre-requisite for the sustainability of our democracies. It is a very dangerous world we are living in," he told Defence Procurement International last summer.

Defence stocks are typically excluded from EU lenders' portfolios based on ESG factors and a desire among financial services firms to avoid reputational risks. As green investment has risen, only 30% of EU and UK-domiciled investment funds, and about 37% of US funds, were exposed to the aerospace and defence sector in March 2024, according to the Principles for Responsible Investment.

Despite a slight improvement since 2022 (+4.6%), defence companies struggle to access private financing. In the case of European firms, this is also due to a regulatory ambiguity in the so-called EU's green taxonomy, which lists activities

considered sustainable. Most defence equipment, unless it is used for civilian and defence purposes, is not labelled 'green' under the taxonomy.

ESG AND SECURITY AT ODDS

The taxonomy regulation published in June 2020 is an EU-wide classification of environmentally sustainable economic activities, aimed at helping the EU to achieve carbon neutrality by 2050.

The document sets out the four conditions that each economic activity must meet to qualify as environmentally sustainable: contributing to at least one of the five environmental objectives listed in the taxonomy: [I] do not significantly harm any of the other environmental objectives; comply with minimum social safeguards and comply with the technical screening criteria set out in the taxonomy delegated acts.

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Defence is not explicitly defined as an ESG-compliant activity, which creates a policy paradox. An EU regulation is having a negative impact on a sector considered as “a crucial contributor to the resilience and the security of the Union, and therefore to peace and social sustainability” — the definition that the EU Commission’s joint communication on the new European Defence Industrial Strategy published in March 2024 gives to defence industrial activities.

“As the European defence industry has developed together with other sectors regarding management of sustainability topics, the exclusion criteria have become problematic as it affects the industry’s ability to finance investment and operations,” Saab’s senior vice president and head of group communication and sustainability, Viktor Wallström, told Defence Procurement International. “The European defence industry must have the required long-term access to both public and private funding to increase capacity to meet customer needs,” he added.

POSSIBLE SOLUTIONS

Aware of the difficulties that European companies are experiencing, the EU Commission committed to launch, together with the EDA and member states, a high-level dialogue with banks and investors to identify, and eventually remove, the existing obstacles to private sector engagement.

In response to the European Council’s mandate to further improve access to finance for European security and defence firms, and as part of the top strategic priorities outlined by the European Investment Bank’s president Nadia Calviño, the EIB is updating its policies to better support defence companies.

“We have revised our eligibility criteria to better support SMEs and innovative startups in the security and defence sector,” a spokesperson for the EIB says. “These companies can now access our specialised financing products, including venture debt financing and equity investments.”

The spokesperson says the EIB has also relaxed previous restrictions that limited SMEs from accessing EIB intermediated credit lines. Soon, “dedicated credit lines” will be available to eligible SMEs and mid-cap defence companies. To push these efforts further, “the EIB is actively engaging” with stakeholders and industry leaders across Europe. This initiative is part of a roadshow in various European capitals, led by EIB vice president Robert de Groot, who oversees security and defence.

ENGAGE REGULARLY WITH THE FINANCIAL SECTOR

In its joint communication on the new European Defence Industrial Strategy, the European Commission clearly states that the non-inclusion of defence industrial activities in the EU’s green taxonomy “does not prejudice defence industries’ environmental performance and should therefore not affect their access to finance”. In fact, this ambiguity prevents defence companies from obtaining private loans, regardless of their ESG commitment.

With Trump gearing up to take office, pressure on the EU to spend more on defence will ramp up significantly. Private investments in the defence sector will become critical. So what actions can be taken by defence companies to reassure banks and investors?

According to Saab, the first step should come from companies, by incorporating “an ambitious management of sustainability issues” in their core business. Wallström also stresses the importance of “engaging regularly with the financial sector to ensure that they are aware of the steps our industry is taking regarding sustainability”.

Political initiatives are also required to make companies’ contribution to safety and security properly valued in the financial sector. The fact that the EIB is revising its policies to better support the defence sector could have a positive effect on banks’ and investors’ willingness to invest in the sector.

Having the EU’s climate bank — as the EIB is otherwise known — “committed to supporting the security and defence sector, while also championing sustainability” demonstrates that the two are compatible when companies are working to respect ESG criteria.

The EIB says it is working collaboratively with industry stakeholders to identify pathways for modernisation and sustainability. “Focus on dual-use technologies can help mitigate some of these challenges by supporting projects that contribute to both defence and sustainability goals,” an EIB spokesperson says. “Our support for projects like the development of green technologies for military applications demonstrates a commitment to balancing defence needs with environmental sustainability.”

A stronger collaboration across defence companies, institutions, banks and investors around ESG factors could unlock higher levels of private investment in European defence. A long-lasting political commitment, both at the EU and the state level, will nevertheless remain crucial for securing funding for defence companies which mainly rely on national defence expenditures. So far, this has been the main missing element for creating a stronger European defence industrial base. ■

ABOUT THE AUTHOR

Giulia Tilenni is a European defence analyst.

FOOTNOTE

^[1] *Climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, transition to a circular economy, pollution prevention and control, protection and restoration of biodiversity and ecosystems.*



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GCC DEFENCE SPENDING ON HIGH ALERT

Regional conflicts and Saudi-UAE competition are reshaping GCC defence spending and priorities. However, cooperation between countries in the region remains fragmented.

By Peter Antill

On the periphery of a conflict (Iran-Israel) that could explode into a major regional confrontation at any time, the Gulf Cooperation Council countries are in something of a precarious strategic position. To ensure their security in a dynamic and highly charged environment, the broad trend in defence spending

since 2008 in the Gulf region has been upwards (Cordesman, 2023), according to the International Institute for Strategic Studies.

Several factors have contributed to the region's growing defence expenditure. The 2011 Arab Spring, the ongoing conflict between Israel and Iran, the war in Yemen, and various foreign military interventions

have added to the region's geopolitical and economic instability.

Military power is vital to the region's ability to counter internal and external threats. Three GCC states — Saudi Arabia (7% of GDP), Oman (5.4% of GDP), and Kuwait (5% of GDP) — feature among the world's top 10 in terms of defence expenditure as a percentage of GDP. For



IDEX defence show in Abu Dhabi
(Copyright: IDEX)

these states, military expenditure is mostly financed out of budget surpluses (Yalta and Yalta, 2021). However, rising inflation, caused by higher energy prices and ongoing supply chain problems stemming from the Covid-19 pandemic and increased international instability, including the war in Ukraine and growing tensions in the Middle East following Israel's attacks on Iranian proxies Hamas and Hezbollah, has meant increased oil price volatility, which has had a downstream impact on regional defence spending.

With inflation in the GCC reaching a high of almost 4% in 2021 (last year it fell to around 2.6%), along with the slow reduction in oil prices (from \$120 a barrel in June 2022 down to just over \$70 a barrel in October 2024), the GCC countries are likely to be fiscally cautious and measured in their defence spending.

However, with rising geopolitical tensions following the 7 October 2023 Hamas attack on Israel, the GCC states may come under pressure to increase their defence budgets in the short term. More funds could be used to cover delayed procurement programmes or for one-off capital projects that support modernisation and domestic development

(Photo:)
TOP COUNTRIES BY MILITARY SPENDING AS % OF GDP

Country	% of GDP
Ukraine	33.55%
Saudi Arabia	7.42%
Qatar	6.96%
Togo	5.44%
Oman	5.17%
Jordan	4.84%
Algeria	4.78%
Azerbaijan	4.55%
Kuwait	4.53%
Israel	4.51%

Source: Worldostats (2024)

goals. The largest spenders in the GCC, Saudi Arabia (7.1% of GDP in 2023) and the United Arab Emirates (5.6% of GDP in 2023), have serious ambitions in terms of expanding their defence industrial base, so higher government revenues should enable them to make critical investments in defence-related R&D to bolster domestic production capabilities. Regional governments, however, will want to avoid higher recurring costs that result in a

sustained increase in the defence budget (for example, changes in force structure). The Gulf states allocate 4% to 5% of GDP on average to defence, which is well above the global average of 2%, meaning the cost of defence is already high compared with other regions (McGerty, 2022).

A LACK OF INTEROPERABILITY

Despite nominally being part of the GCC, each state tends to set their defence budgets, force structures and defence procurement separately. Sporadic efforts to create a more unified GCC force structure with effective joint force planning, command and control, and interoperable units have had limited success.

The Peninsula Shield Force, which comprises members from all six GCC states, faces challenges in material readiness, combat system and support availability, force interoperability, and appropriate manning. The main difficulty has been political limitations exacerbated by the tensions within the GCC linked to historic Arab tribal rivalries and internal social tensions rather than external pressures.

The armed forces of the GCC countries are still largely independent national

Saudi Arabia ordered more than 70 Eurofighters from the UK (Photo: Eurofighter)



entities, most of whom are dependent (to one degree or another) on US military support, broader exercise planning and overall campaign management in any serious conflict with Iran (Cordesman, 2023).

Growing economic and strategic competition between Saudi Arabia and the UAE has resulted in differing approaches to regional conflicts, greater economic competition, and unilateral attempts to exert political influence abroad. Indeed, this competition over GCC leadership has led to increasingly divergent foreign policies. The assertive and independent approach pursued by the UAE threatens Saudi Arabia's regional ambitions and its dominant status within the GCC.

Meanwhile, fear of Saudi hegemony among the GCC countries has hindered further integration between member states, and Riyadh's reluctance to relinquish its dominance has damaged the "cohesion of the organisation" (Babood, 2023).

INCREASING RELIANCE ON CHINA

The tensions within the GCC generally preclude any serious cooperation concerning military procurement, even though it would lead to decreasing costs and enhanced interoperability. Instead, each state pursues its own procurement goals, with the purchase of advanced weapons systems long considered a way of buying a degree of protection and a relative commitment to their security.

Much of the equipment acquired comes from abroad, which has the potential to introduce vulnerability in the procurement process, such as supply chain constraints due to geopolitical tensions. While the US has been the main supplier, accounting for as much as 50% of arms transfers into the GCC, the UK and China have also been major players. Between 2010 and 2020, Saudi Arabia imported \$245 million worth of defence equipment from China and ordered 72 Eurofighters from the UK. Between 2010 and 2021, China supplied Qatar with \$118 million worth of arms,

with the remainder coming from the US (\$4.2 billion) and France (\$2.3 billion).

The UAE has acquired air defence systems and rocket launchers from China and South Korea. While buying advanced weapon systems bolsters the effectiveness of armed forces without additional spending on being able to field joint, combined arms formations, well-trained troops to deploy them, effective command, control and communications (C3), and adequate logistics to operate at a distance from their home base, the GCC states will still have to rely on outside support (principally the US) if a major conflict breaks out.

While the GCC countries enjoy common economic projects and a customs union, efforts to achieve greater coordination and cooperation in defence and security policy, greater interoperability between GCC armed forces, and increased cooperation in defence procurement have had more limited success.

This is partly due to the complexities and internal forces inside the GCC itself, and a desire not to provoke stronger

regional powers, such as Israel, Egypt and Iran. Under its Vision 2030, Saudi Arabia has outlined a bold vision to manufacture more than half of its defence needs within the country by 2030. One way of ensuring this would be for the GCC states to expand their defence industrial base via dialogue and partnerships, "transforming the domestic defence industry from a supplier into a planning partner, making it a key element in mission success by improving readiness and sustainment. This approach uses the need for sustainment to identify and build domestic defence industrial capabilities in line with national priorities," (Karlsson et al., 2023, p. 2). ■

ABOUT THE AUTHOR

Peter Antill graduated from Staffordshire University in 1993 with a BA (Hons) in International Relations and gained a MSc Strategic Studies from Aberystwyth in 1995 and a PGCE (Post-Compulsory Education) from Oxford Brookes in 2005. He worked at Cranfield University at Shrivenham from June 2009 to 2019, creating a defence acquisition body of knowledge.

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OPINION

DIPLOMATIC HIGHWIRE:
MOSCOW'S COMPLICATED
RELATIONSHIP WITH TEHRAN

Russia and Iran's alliance is more a marriage of convenience than a strategic partnership built on lasting trust.

By Cassia Scott-Jones

The alignment of Russian and Iranian interests in Syria and Ukraine has popularised the view that these countries have become genuine strategic allies, transcending the transactional nature of their historical relationship. This is at best a premature conclusion.

Both cooperation and friction marked the Syrian civil war. Russia favoured working with Syrian government forces, whereas Iran supported Hezbollah fighters and other pro-Assad groups.

Iran revoked the Russian Air Force's access to the Shahid Nojeh Air Base in 2016 despite mutual interests. Iran's Defence Minister Hossein Dehghan remarked that Russia had displayed a "show-off" attitude after the

Kremlin publicly announced that Tupolev-22M3 long-range bombers and Sukhoi-34 jets had used an Iranian base to launch airstrikes in Syria. While these countries shared an interest in maintaining the Bashar Al-Assad regime, cooperation was uneasy.

Outside Syria, Russian-Iranian relations have generally resembled a patron-client dynamic. Iran has historically found itself petitioning Russia for more advanced weaponry, which Moscow has often proven reluctant to provide. For instance, in 2010 Russia terminated its S-300 missile system deal with Iran, creating diplomatic tension that lasted until the agreement was reinstated in 2016 following the implementation of the Iran nuclear deal. Still, as

Iran had limited offerings to make Russia in exchange for technological cooperation, Moscow did not view an alliance with Iran as particularly valuable.

However, the escalation of the Russo-Ukrainian war allowed Iran to strengthen its hand. Less than six months into the full-scale invasion, the voracious demand of the Russian military had outpaced the production of its industrial base. The outdated and poorly maintained state of Soviet-era stockpiles meant that Russia needed external suppliers, and Iran stood out as one of the very few willing to sell.

Iran has since supplied Russia with a range of military equipment, including over 200 Fateh-360 short-range ballistic missiles, Iranian-developed Shahed-131/136 drones, as well as artillery shells to support Russia's ground war efforts. Iran also agreed to economic cooperation with Russia, linking their financial systems and developing new trade routes after Russia was cut off from the SWIFT international banking system.

While the situation has evolved, and Russo-Iranian ties were strengthened by the Ukraine war, Russia still has more to offer Iran than Iran can offer in return.

Russia fails to hold up its end of the deal

On October 25 2024, the Israeli Defense Forces (IDF) conducted three waves of strikes into Iran, successfully targeting critical facilities and S-300 air defence systems, in

yet another damaging blow to the credibility of Russian military technology. The IDF is confirmed to have hit at least two S-300 batteries, exposing Iran's vulnerability against F-35 jets. Tehran had hoped its arms transfers to Russia would help it procure Su-35 jets and S-400 air defence systems which would provide stronger protection against the Israeli airstrikes.



Outside Syria, Russian-Iranian relations have generally resembled a patron-client dynamic. Iran has historically found itself petitioning Russia for more advanced weaponry, which Moscow has often proven reluctant to provide.



However, there is no verified evidence to suggest Russia has fulfilled its end of the deal despite repeated claims from Iranian news outlets suggesting Iran has received an S-400 air defence system and a squadron of Su-35 fighter jets. Whether these systems are quite as impenetrable as Iran



Iran says it has received an S-400 air defence system from Russia (Photo: Dmitry Fomin)

believes is another question. Ukrainian forces are confirmed to have knocked out several S-400s using US-manufactured ATACMS.

On that point, Russia is considerably overextended in Ukraine. Russian air defence assets are spread thinly between the 1000-km-long frontline in Ukraine and the combat zone inside Russia (Kursk Oblast). Behind the front, Ukrainian drones now routinely reach military assets and oil refineries deep inside Russia. The systems that Iran seeks from Russia, such as the S-400, are far more critical than those Iran can provide.

Given the strain on Russian military resources, it is unlikely that Russia will provide these weapons in the desired quantities. Instead, Russia may license Iran to build the equipment itself – a relatively arduous process in an urgent situation. Russia does not seek a regional war in the Middle East, but it would be rid of one of its key competitors in the Chinese oil market if Israel decided to target

poorly protected Iranian oil infrastructure.

There is also the issue of Iran’s history with intelligence leaks. Recent events such as the assassination of Hamas political chief Ismail Haniyeh in Iran, point to considerable Israeli intelligence presence in the Iranian security services. Russia is likely to be wary of handing over sensitive information to the Iranians, given indications that such information could end up in the hands of the US.

Central to this issue is the Global Navigation Satellite System (GLONASS), Russia’s equivalent to the US GPS. In January 2020, Iran reportedly used GLONASS for its ballistic missile strikes against the US-held Al Assad Airbase. Iran’s short-range satellite-guided tactical ballistic missile, the Fath 360 system, is believed to use this technology. Given the threat of escalation with Israel, Iran is likely to seek further integration of this technology into other systems.

However, for Iran to access the military-grade version

of GLONASS, which provides enhanced accuracy and protection against jamming, Russia would need to disclose cryptographic keys. Given Iran’s extensive history with intelligence leaks, the Kremlin may prefer to leave its “strategic partner” exposed.

While Russia and Iranian interests converge when it comes to undermining US influence, their priorities do not

always align, and Tehran would be unwise to count on Moscow as an ally. Russia has always sought to balance its relations with Iran by maintaining cooperative ties with countries in the Gulf Cooperation Council, such as Saudi Arabia and the United Arab Emirates. A Saudi-Iranian détente has made this balancing act a little easier, but there are still friction points. In September, Russia pulled out of an Iran-brokered deal that would involve the transfer of Russian anti-ship cruise missiles to the Houthis at the last minute.

CNN reported that Russia withdrew amid intervention from Saudi Arabia, who were at war with the Houthis for seven years before a fragile truce was negotiated in 2022. Russia values its relationship with the GCC countries due to their cooperation within the framework of the Organisation of the Petroleum Exporting Countries to influence oil prices. It is worth noting that this cooperation has at times, marginalised Iran’s interests as an oil producer.

Undermining the US

However, there are areas where Russia appears willing to test its relationships with Saudi Arabia and the UAE. In September 2024, US Secretary of State Antony Blinken revealed that “Russia is sharing technology that Iran seeks,” implying that Moscow may be trading nuclear secrets for Iranian weapons. Russia has also provided targeting data to Houthi rebels, facilitating their missile and drone attacks on Western ships in the Red Sea.

According to the Wall Street Journal, the data was relayed through Iran’s Islamic Revolutionary Guard Corps members embedded with the Houthis. Remarkably, this failed to stop tankers carrying Russian oil cargoes, including those linked to Kremlin-connected Rosneft, being attacked by the Houthis. Only a select group of officials and market players are privy to the Russian connection with these covert shipments, and clearly, the IRGC was not entrusted with this information.

Russia’s support for the Houthis and other Iranian proxies is still undoubtedly more about undermining the US than it is supporting Iran, and if a regional war were to break out in the Middle East, Russia is neither able nor willing to come to Iran’s aid. The “Axis of the Sanctioned” is not a genuine partnership, but a marriage of convenience.

Cassia Scott-Jones is an economist covering the Russo-Ukrainian War.

25 YEARS OF BOXER

December 2024 marked 25 years since the international BOXER armoured military vehicle programme was formally integrated into the Organisation for Joint Armament Cooperation (OCCAR), which delivers the 8x8 to Germany, the Netherlands, Lithuania, and the UK.



With its genesis in the post-Cold War era, tighter defence budgets saw Germany, France, and the UK work together to define the concept and early phases of the BOXER multi-role armoured fighting vehicle programme to meet varying national requirements.

A particular focus was on delivering vehicles that could meet various operational scenarios whilst addressing key mobility, protection, and load-bearing requirements. However, the early years of the BOXER programme were characterised by setbacks as countries' requirements shifted.

France and the UK ended up leaving the BOXER programme to pursue other vehicle designs: the Véhicule Blindé de Combat d'Infanterie (VBCI) in the case of France; and the Future Rapid Effect System or FRES in the UK. FRES was later cancelled. However, in 2018, with the BOXER gradually expanding its user base



In February 2024, the Lithuanian BOXER (VILKAS) order successfully passed its Live Fire Testing (Photo: OCCAR)



The UK rejoined the BOXER programme in 2018 to meet a requirement for a Mechanised Infantry Vehicle for its new Strike Brigades. (Photo: MoD/Crown Copyright)

(the Netherlands, Lithuania, Australia's Land 400 programme) and having seen operational use in Afghanistan, the UK rejoined the programme to fulfil a requirement for a Mechanised Infantry Vehicle to equip the British Army's new Strike Brigades, a key part of Joint Force 2025 as laid out in the 2015 Strategic Defence and Security Review.

Over the last 25 years, more than 1,350 BOXER vehicles, with a value of more than €6.2 billion have been placed under contract for Germany, the Netherlands, Lithuania, and the UK. More than 400 vehicles have been supplied to Germany, 200 to the Netherlands, and more than 90 to Lithuania. The UK has the largest order of BOXER vehicles so far, with 628 on contract; initial production deliveries of vehicles commenced in 2024 and will run to 2032.

Behind the scenes, OCCAR's BOXER programme division, working closely with the prime contractor, ARTEC, a joint venture of KNDS Deutschland, Rheinmetall Landsysteme and Rheinmetall Defence Nederland, has been fundamental to the BOXER programme's progress and success. We sat down with Alexandra

Alonzi, BOXER programme manager at OCCAR, to find out how it balances the benefits of commonality of the vehicle across user countries, whilst ensuring BOXER is adaptable to meet a wide range of operational scenarios and user requirements.

Q: What are some of the biggest challenges in fielding so many different BOXER variants to the four participating countries?

Alexandra Alonzi: Notwithstanding a focus on ensuring commonality across the BOXER programme, nation-specific adaptations and new variants will always require additional management effort. This includes all the usual activities for programme management and contracting, further design, development, and testing. Logistics and in-service support also need to be considered.

All these additional efforts require resources and time to complete. OCCAR now has 19 variants of BOXER on contract and at various stages of development, delivery and in-service support, a challenge is also to ensure adequate configuration control and

management of engineering and logistical dependencies, changes and obsolescence.

Q: How much cross-pollination of ideas is there among countries regarding different Boxer configurations?

Alonzi: There is a significant amount of cross-pollination between all nations. Countries have adopted the common drive module by utilising the prevalent drive module version when they place their production contracts.

Regarding mission modules, the first variants developed were the most commonly procured by all nations, namely driver training, infantry carrier, command and ambulance variants, notwithstanding an element of nation-specific adaptations.

To support nations' considerations for further BOXER vehicle orders, OCCAR provides the critical platform for nations to discuss and cohere requirements for more effective and efficient procurement.

Q: How do you interact with countries in the programme to ensure the timely delivery of vehicles, at reduced cost?

Alonzi: Nations have formed a BOXER Programme Memorandum of Understanding from which formal OCCAR tasking is derived. The programme is governed by a series of formal interactions, including programme reviews, committees and boards, which bring together OCCAR, nations and industry.

Beyond this, the BOXER programme division has also implemented a drumbeat of stakeholder engagements adapted to the current programme landscape, which sees exceptionally close working between OCCAR staff members and representatives from nations and industry.

Close and cooperative interactions between all relevant stakeholders mitigates emerging programme issues and supports the timely delivery of vehicles and other programme deliverables. Furthermore, by operating through a common international platform and contract through OCCAR, nations can access wider programme information, leverage lessons learned and cohere management activities, which ensures programme costs are reduced for nations.

Q: How are information and lessons learned, shared between the various BOXER programme countries?

Alonzi: Numerous forums exist to share information coordinated through OCCAR. These include formal programme review meetings, committees, and boards, which provide a valuable platform for countries to exchange information, identify common challenges and share lessons learned.

One of the key benefits of an international programme platform is that BOXER programme division staff members within OCCAR, as well as industry counterparts, often work across multiple different workstreams and can ensure that information and lessons learned are shared across the programme effectively.

The benefit to nations is to shorten programme timescales, reduce costs, share operational lessons, and build

KEY DATES IN THE BOXER PROGRAMME

1996

The German Ministry of Defence released an Invitation to Tender to several German companies, which teamed up with several other European firms to form two consortia. The first, initially known as Euroconsortium, later became ARTEC, which stands for Armoured Vehicle Technology. The second consortium was called TEAM International.

1998

The ARTEC consortium is declared the winner of the tender.

1999

The BOXER Programme is integrated into OCCAR. However, France leaves the programme to pursue its Véhicule Blindé de Combat d'Infanterie design.



Command Post

2003

The UK announces its withdrawal from the BOXER programme.

2006

The first BOXER production contract is signed, procuring 605 German and Dutch BOXERs in driver training, infantry carrier, command, ambulance, cargo and engineering vehicle variants.



Driver Trainer

2011-2014

The BOXER sees operational use in Afghanistan.

2016

Lithuania joins the BOXER programme with an order for 91 vehicles.



ISV Squad

2018

The UK rejoins the BOXER programme with a large order for 628 vehicles in command, infantry, specialist carriers, and ambulance variants.



Specialist Carrier

2019

Australia joins the BOXER Programme as an observer nation.

25TH ANNUAL INTERNATIONAL ARMoured VEHICLES



SCAN FOR
2025 AGENDA



THE WORLD'S PREMIER ARMOUR CONFERENCE

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IAVC's **new location at Farnborough International Exhibition Centre** will have a larger exhibition hall, offering more opportunities to meet key providers, decision-makers, and view the latest armoured vehicles in an interactive setting. The venue's layout will make it easier to move between plenary sessions, workshops, and networking meetings.



The new 3-day agenda includes more content to fully address key issues in the armoured vehicle community, along with **additional opportunities for in-depth discussions** with peers to tackle current challenges.



A wider selection of **tailored workshops**, including topics like additive manufacturing for maintenance and active protection systems, enabling more diverse discussions on operational challenges with peers and colleagues.



IAVC will bring together **more nations and organisations** than ever, providing opportunities to build new relationships within the armoured community and hear updates on their latest programmes, paving the way for future collaborations.



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2025 SPEAKERS INCLUDE:



General Sir Roly Walker
Chief of the General Staff
British Army



Lieutenant General Carmine Masiello
Chief of Army Staff
Italian Army



Major General Glenn Dean
PEO Ground Combat Systems (GCS)
US Army



Major General Lizzie Faithfull-Davies
Director Land Equipment
DE&S



Major General Jonny Lindfors
Commander
Swedish Army

BOXER capability resilience by strengthening supply chains. This is also valid for future evolution.

Q: Can you talk about the Joint Fire Support design and development project you are working on with Germany?

Alonzi: OCCAR has been tasked by Germany to design and develop a "Joint Fire Support Team, heavy (JFSTsw)". The objective of the JFSTsw is to support the armoured corps with fire support from artillery, air, or naval forces. It combines the Artillery Observer, Forward Air Controller and Marine Spotter requirements of reconnaissance, communication, mobility, and protection into a single capability.

This is under contract by OCCAR to ARTEC, as our prime BOXER contractor. The project is currently undergoing design and development, working towards a full Critical Design Review soon. Assuming these final stages are successful, the

German customer could then choose to place a production order for these BOXER variants in the coming years.

Q: What impact has increased geopolitical tensions, had on the vehicle programme and joint procurement through OCCAR?

Alonzi: Considering the backdrop of evolving security threats and the importance of developing state-of-the-art land platforms and defence capabilities, there is always a wide and constant interest in the BOXER platform.

An already established programme like BOXER can shorten the lead time for development, production, and fielding, which is particularly attractive for nations in meeting their current defence strategic priorities.

The importance of cooperation and interoperability is also increasing in priority. OCCAR can provide the ideal platform for integrating new nations into the programme as integration and

management of international agreements is a key area of expertise.

Q: How could BOXER benefit from projected increases in EU defence spending in the coming years?

Alonzi: Increased defence spending invested in the BOXER programme could bring many additional benefits. It could see current or new nations choosing to procure further BOXER vehicles, either in existing variants or developing new variants.

The development of new variants means the BOXER capability can continue to evolve, remain relevant and enable the latest technological developments to be assimilated into the vehicle. This will ensure that the key objective of the BOXER to be flexible and adaptable to meet a wide range of operational scenarios continues to be met in the future.

Furthermore, any increase to order numbers for the BOXER and a longer-term order book will also build resilience, capacity and growth for key industry partners and the supply chain. ■



A UK BOXER armoured vehicle during fleet demonstration trials, which took place in July, 2023 (Photo: OCCAR)



POWERING DEFENCE

**From rally car racing to the battlefield,
Allison Transmission is transforming the
future of vehicle mobility.**

By Anita Hawser



With a history steeped in some of the most pivotal moments in automotive history, it should come as no surprise that globally, more than 600,000 Allison transmissions

have been deployed in defence applications. In Europe, the Middle East and Africa, approximately two-thirds of all wheeled combat vehicles currently in production use Allison transmissions, according to the

Indianapolis-based manufacturer whose founder James Allison, is best known for building the Indianapolis Motor Speedway in the early 1900s, which hosts the iconic Indy 500 speed race.

A Komondor RDO 3121 fitted with an Allison 3200 SP fully automatic transmission on the test track at the Customer Experience Centre in Hungary (Photo: Allison Transmission)



Allison Transmission factory floor in Hungary where transmissions for commercial and defence applications undergo final assembly and customisation (Photo: Anita Hawser)

A die-hard racing enthusiast, when World War I broke out, Allison directed his Indianapolis Speedway Team Company to focus on the war effort, with engineers turning their hand to developing aircraft engines. But it was during World War II where the company really honed its skills in the defence sector, pioneering automatic cross drive transmissions — the CD 850 — for military tanks.

Today, its cross drives can be found in military tracked vehicles the world over, including the US Army's iconic M1 main battle tank, as well as BAE Systems Hägglunds' CV90 infantry fighting vehicle which is popular with northern European armed forces. The Mk3 version of the CV90 is fitted with the X300 heavy duty transmission system, while Mk4 versions of the vehicle will feature the new Allison 4040 MX propulsion solution produced in Indianapolis.

In October 2024, at the Allison Customer Experience Centre in Hungary,

journalists were treated to a tour of the factory where transmissions for all kinds of commercial and defence applications undergo final assembly and customisation before being shipped out to customers.

From factory floor to test track, we piled into different heavy-duty wheeled vehicles fitted with Allison transmissions — a Dakar rally truck, a 24-year-old American school bus with 430,000 kilometres on the counter, as well as the Tatra Titus and URO Vamtac defence vehicles — to see how they performed, both on and off-road.

Laurent Mayzerac, Europe defence manager at Allison Transmission, says defence customers benefit from Allison's experience in other sectors, namely rally car racing. An Allison-equipped rally truck has won the Dakar Rally for the last three years running.

"For defence, reliability of the vehicle is important and the capability to keep it in motion, whatever the terrain," says Mayzerac. "It's the same for a racing truck

that really needs to set the best time, whatever it comes across, whether it is dunes, rocks, or muddy terrain."

The development needed for off-road rally driving and wheeled defence vehicle transmissions is pretty much the same, says Mayzerac, in terms of guaranteeing reliability, and the proper torque to the wheels. Approximately 95% of the transmissions used in rally trucks is also used in wheeled vehicles for defence, he estimates.

"The [benefit] of having a design for commercial applications that is also being used for defence, is the proof of concept, endurance and demonstration of the intensive use of those concepts," says Mayzerac.

In the last two years, the defence sector in EMEA has produced approximately 4,400 armoured personnel carriers and combat vehicles and another 6,000 logistics, tactical and support vehicles. Allison Transmission believes

the latter presents an opportunity for the adoption of fully automatic transmissions as defence organisations recognise the need for non-combat vehicles to operate more effectively in demanding “off-highway” environments.

Considerable R&D dollars are being ploughed into coming up with different transmissions for different torque and vehicle weight applications, says Mayzerac. With an eye on the future, Allison Transmission is also building new hybrid transmissions for wheeled and tracked vehicles.

The 3040 MX transmission for medium-tracked vehicles or the 4040 MX will feature an option for hybrid transmission, which is new in the history of Allison, says Mayzerac. “We’ve been working on hybrid transmissions already for 20 years, but it’s the first time that they seem to be required as well for tracked vehicles and cross drive transmissions.”

Mayzerac says the first cross drive transmissions with the hybridisation option are being tested and evaluated on

unspecified military vehicles, with tests already underway in Poland.

New transmissions with more capabilities, including hybrid propulsion, are also being designed for tracked vehicles that are getting much larger and heavier because of new turrets and equipment.

“We’ve been working on hybrid transmissions already for 20 years, but it’s the first time that they seem to be required as well for tracked vehicles and cross drive transmissions.”

While fully electric vehicles do not make sense for defence customers, Mayzerac says there are a lot of advantages to hybrid solutions. “With the development of lighter battery technologies and more

powerful electric drives, we are able to design [a transmission] for hybrid vehicles that makes more sense for armies.”

Given the wealth of electronic and power-hungry systems – radars, automatic protection systems, communications systems — on board armoured vehicles these days, Mayzerac says instead of having a small alternator that was in the past coupled to the diesel engine, the hybrid capability of the transmission can be used as a generator to produce electricity for these sub-systems.

While growing vehicle weight is not a deal breaker when it comes to designing transmissions, Mayzerac concedes it is a challenge for the many defence vehicle OEMs it works with to find the right balance between all the optional subsystems that armies want to add to the vehicle, the extra armour needed, and the size of the engine and transmission. “The more weight, the more brake mobility you need,” he explains, “so the bigger the transmission. These days, transmissions are almost as much volume as the engine in a main battle tank, so they get very big.” ■

"For defence, reliability of the vehicle is important and the ability to keep it in motion, whatever the terrain."

(Photo: Allison Transmission)



BATTLE-FIELD AGILITY, AND RELIABILITY

GM Defense's Infantry Squad Vehicle leverages the Colorado ZR2 commercial pickup truck to deliver "better boot" for US and Canadian forces.

By Anita Hawser

Having weathered the toughest test for soldier and machine in searing 53°C heat during UAE Armed Forces' Summer Trials, handling the muddy, rocky, and steep terrain at Millbrook Proving Ground in Bedfordshire was a piece of cake for General Motors Defense's Infantry Squad Vehicle (ISV).

"With some vehicle suspension systems, there is a fine line between going too slow or too fast, but the ISV gets troops into battle fit to fight," said Martin Ormond, chief test driver and driving instructor, Cytec Consulting, who demoed the US Army's rapid ground mobility vehicle at UTAC Millbrook in September during the British Army's DVD2024.

Originally developed to meet a US Army requirement for mobility on the battlefield for a nine-soldier light infantry squad and their equipment, the ISV is fielded with the US Army's 82nd and 101st Airborne divisions and recently secured its first international sale to the Canadian Armed Forces.

Bradley Watters, vice president of international business development at GM Defense, says the vehicle came out of a requirement to deliver "better boot".

"The ISV can be low-velocity air dropped, so when paratroopers come in, they can jump in the vehicle and go to where they need to go very quickly on the battlefield instead of hiking and marching to the next location."

The ISV can be underslung from a Black Hawk helicopter or inserted into a Chinook. "If you have troops in a jungle area, the ISV can be dropped in [so they can] easily push on to the next mission," says Ormond.

During the UAE 2023 Summer Trials, the ISV travelled almost 2,000 km across different terrain — roads, cross-country, dunes, soft sand, mountainous areas — in the hottest and driest part of the summer. It was the first time that GM Defense had sent a vehicle to the gruelling trials which followed the announcement of a cooperative agreement with the UAE





The ISV was originally developed to meet a US Army requirement for battlefield mobility for a nine soldier light infantry squad. (Photo courtesy of GM Defense)

Ministry of Defence's acquisition authority, Tawazun Council at the International Defence Exhibition and Conference in February 2023.

Ormond says the vehicle carried more than one tonne of weight during the trials out in the UAE. The maximum payload for the ISV is just over 2 tonnes. "It can carry nine troops, ammo, weapons and kit for soldiers to be self-sufficient for at least 72 hours on the ground and still perform off-road with that weight," says Ormond.

A MILITARISED PICK-UP TRUCK

Watters says the ISV was also one of only two vehicles that passed every stage of the trials, including a maintenance trial, with no issues whatsoever. The maintenance trial entailed removing the engine and reinstalling it in searing 53-degree Celsius heat, as well as a starter removal and reinstall.

Even for the less technically minded soldier, Watters says the ISV is easy to

maintain. "You just pop the hood. It's like looking at your normal pick-up truck."

“ It can carry nine troops, ammo, weapons and kit for soldiers to be self-sufficient for at least 72 hours on the ground and still perform off-road with that weight.

Ninety per cent of the ISVs components are commercially available off the shelf from GM's Chevrolet Colorado ZR2 off-road pickup truck, which is the base platform for the military vehicle. It features a 2.8-litre Duramax engine, six-speed transmission, and Chevrolet Performance off-road racing components.

Another benefit of leveraging a commercial platform like the Colorado ZR2 is that the vehicle's ergonomics are easy to operate. Shifting from 2WD to 4WD is as simple as flicking a switch. The ISV comes with two types of 4WD: 4WD high and 4WD low.

No firm Middle East orders for the ISV have been announced, but at DVD2024, Watters hinted that a deal could be "in the works". The test track at UTAC Millbrook was no substitute for the Arabian desert, but it was enough to showcase how well the ISV handles off road. "The off-road capability is phenomenal for a small vehicle," says Ormond. "It doesn't shy away from anything."

When you talk about suspension, it is still commercial, but GM pulled in its performance racing from desert rally driving. "We were able to leverage off that whole catalogue of parts," says Watters.

GM Defense also took active and passive safety equipment from the commercial side – ABS brakes and



The ISV can be underslung from a Black Hawk helicopter (Photo courtesy of GM Defense)



The ISV at UAE Summer Trials in 2023 (Photo courtesy of GM Defense)

electronic steering stabilisation which can be switched on and off. “That helps the driver if they are in a situation where they are at risk,” says Watters.

The ISV showcased at DVD2024 was the baseline model, which usually doesn’t feature doors, but it was enclosed for the first time at Millbrook. The mission configurations for the ISV are endless,

says Ormond. “It can be armoured, configured for logistics, or dropped into the frontline for troops.” The middle seat can be removed and replaced with a comms stack. A turret system can be added, and a standard-size army stretcher can also be placed inside the vehicle by lifting the three second-row seat cushions.

The ISVVV entered full-rate production in April 2023. According to Defence News, the US Army currently plans to buy a total of 2,593 ISVs over the course of the programme. In July 2024, Canada’s Defence Minister announced a \$35.8 million deal to equip Canadian Army personnel in Latvia with 90 new Light Tactical Vehicles based on GM Defense’s ISV. The vehicle will allow NATO Enhanced Forward Presence Multinational Battlegroup forces in Latvia to move with greater speed, range, and safety across complex terrain.

European forces can expect exposure to ISVs through US Army units stationed and deployed to Europe. The US Army lent ISVs to the UK Army for a Project Convergence exercise in 2024. GM Defense is ramping up production of the ISV troop carrier in addition to its Infantry Utility Vehicle to meet increased demand under existing contracts. Like the ISV, the IUV is based on the ZR2 off-road variant of the Chevrolet Colorado. ■

ISV MAIN SPECIFICATIONS	
Assembly location	Concord, North Carolina, US
Layout	Front-Engined, Longitudinal
Engine	Duramax 2.8L I-4 LWN
Transmission	6-Speed Auto
Drive wheels	Four-Wheel Drive with Hi/Lo functionality
Suspension	MultiMatic Dynamic Suspensions Spool Valve (DSSV) dampers developed for the civilian-spec Colorado ZR2

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HOW COULD ARMIES COUNTER FPV DRONE THREATS?

A laser-equipped Stryker prototype developed by Leonardo DRS is taking aim at battlefield drones.

By Peter Ong

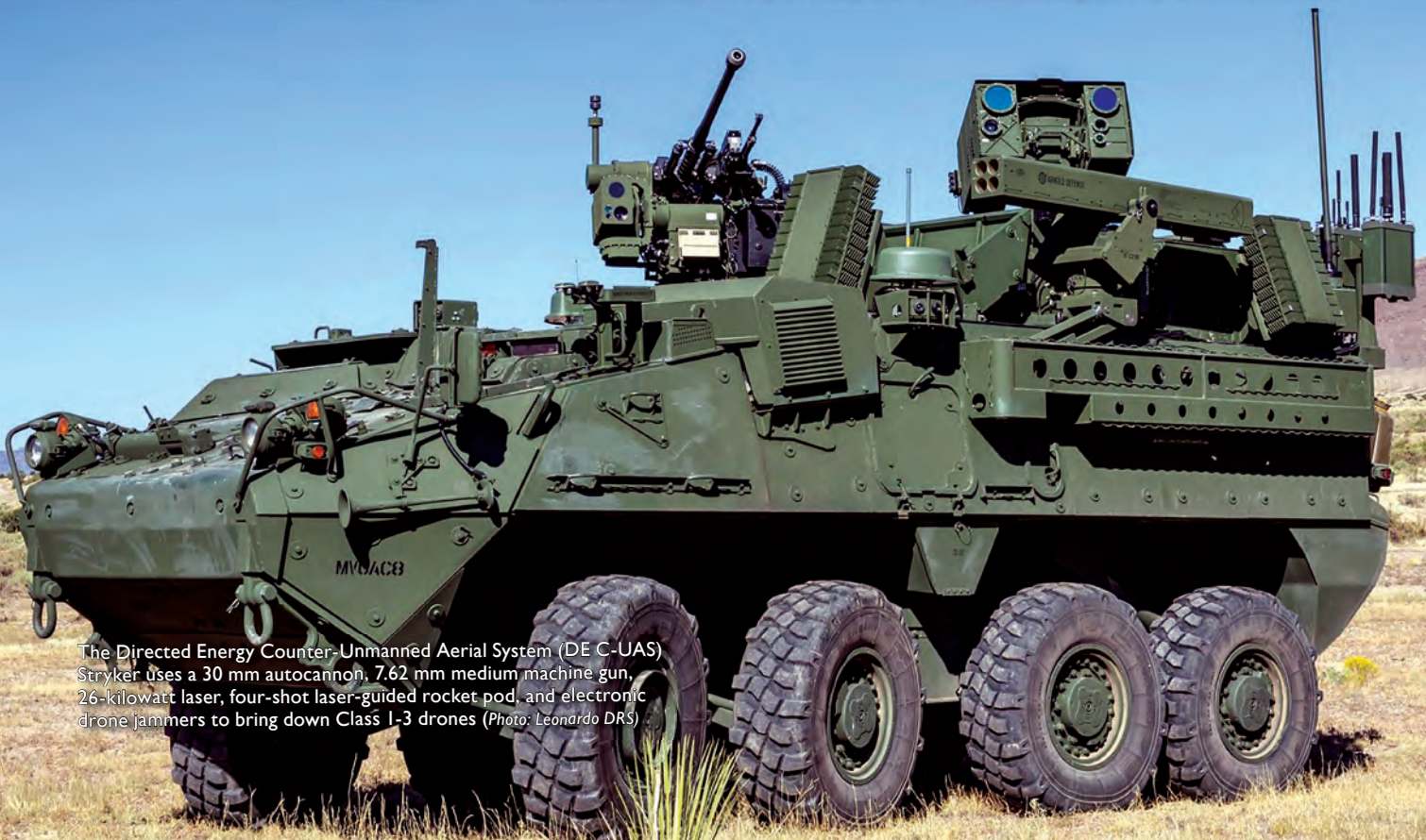
The proliferation of First Person View drones on battlefields such as Ukraine, presents a challenge for armies. FPV drones are essentially cheap “hobby” quadcopters costing anywhere from \$100 to \$1,000. They are piloted by an operator who sees with the drone’s onboard cameras which send live video to a controller screen. The problem is that both the Russian and Ukrainian

infantry have strapped high explosives to these hobby drones to turn them into kamikazes that can attack an armoured vehicle’s weakest spots — the turret ring, engine compartment, or exhaust grill.

Countering FPV drones with expensive short-range air defense missiles that cost hundreds of thousands of dollars and are in limited supply, is not an option. Can one vehicle counter the variety of hobby and

military drones out there?

The US Army’s Directed Energy Maneuver Short-Range Air Defence (DE M-SHORAD) Stryker with a 50-kilowatt laser that can shoot down drones and mortar rounds, and Leonardo DRS’s directed energy counter-unmanned aerial system mounted (C-UAS) on a Stryker concept demonstrator vehicle, are mobile vehicles assigned to protect mechanised



The Directed Energy Counter-Unmanned Aerial System (DE C-UAS) Stryker uses a 30 mm autocannon, 7.62 mm medium machine gun, 26-kilowatt laser, four-shot laser-guided rocket pod, and electronic drone jammers to bring down Class 1-3 drones (Photo: Leonardo DRS)

maneuver forces against UAVs. The DE C-UAS Stryker is an independent research and development effort led by Leonardo DRS. “[It] is a great example of what is possible when industry works together to help the Army,” a Leonardo spokesperson told Defence Procurement International.

Industry invested R&D dollars completed the project in just eight months. While not an official US Army Programme of Record, in October 2024, Leonardo and BlueHalo, which developed the 26 kW LOCUST Laser Weapon System on board the DE C-UAS Stryker, demonstrated the vehicle’s capabilities to US Army officials in Socorro, New Mexico.

Both companies announced that the mobile C-UAS capability successfully destroyed numerous drones using the LWS. Additionally, the demonstration included near-simultaneous C-UAS and ground engagements with the laser and a 30 mm remote weapon station.

Leonardo DRS created the DE C-UAS Stryker concept demonstrator to defeat Class 1-3 drones. The prototype was designed and built using a modified Stryker infantry carrier vehicle. The DE C-UAS

Stryker can engage ground and air threats with a mix of kinetic and non-kinetic defeat technologies. While its primary mission is to counter unmanned systems, according to Leonardo DRS, it has the mobility, firepower, and protection to fight at the tactical level and protect the vehicle and crew against ground threats.

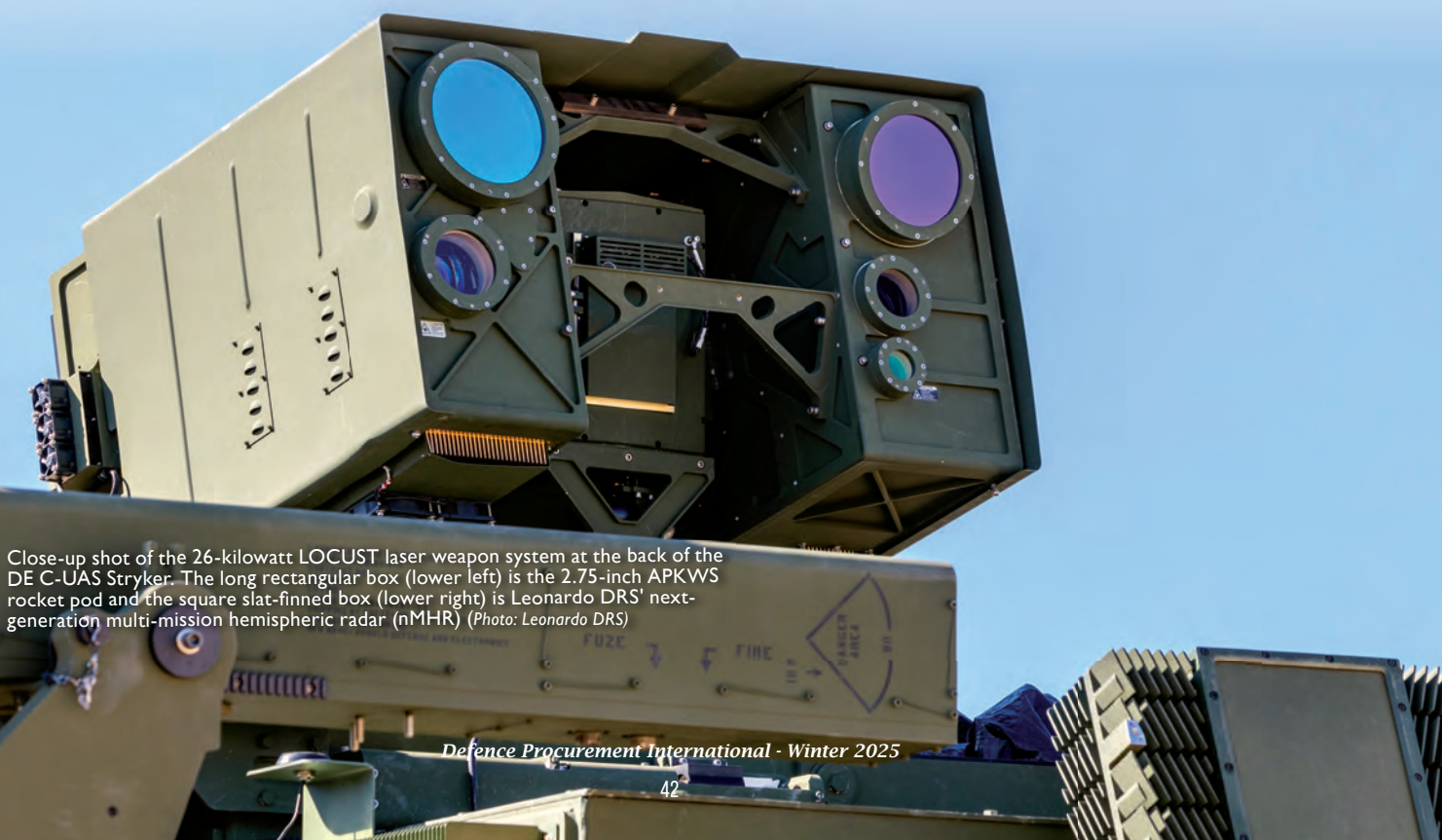
A “NEAR-BOTTOMLESS” MAGAZINE TO DEFEAT DRONES

A DRS-designed enhanced power solution provides the required power for the LOCUST LWS. The LWS and the Advanced Precision Kill Weapon System (APKWS) can be fired from a short halt. The primary Remote Weapon System (RWS) includes the 30 mm XM914 and the 7.62 mm M240B medium machine gun. Both are single-feed weapons and fire all available types of ammunition. The RWS has 165 ready rounds and the APKWS launcher has four ready-to-fire rockets. During an industry-led engineering test in September, crew were able to fire the RWS and LWS simultaneously. A live-fire demonstration with the APKWS is anticipated in early 2025.

The DE C-UAS Stryker gives warfighters multiple tools — radio frequency, directed energy, and kinetic — to defeat a wide variety of air threats. According to Leonardo DRS, the weapon system can engage multiple drones with kinetic effectors and the laser weapon system simultaneously or “near simultaneously”.

As the Stryker includes an enhanced power solution, the laser is not constrained by a power-limited duty cycle. “The gunner can engage and defeat a drone and immediately slew to the next drone,” a Leonardo DRS spokesperson told Defence Procurement International. “Without being constrained by battery power, the C-UAS DE Stryker really does provide a near-bottomless magazine to engage and defeat drones.”

While the crew is engaging drones with the laser, they can also engage drones with the RWS. If employed with a kinetic defeat C-UAS capability, the C-UAS DE Stryker dramatically increases the stowed kills available to commanders. Leonardo DRS claims that the LWS can defeat drones that use fibre-optic cables to prevent jamming. “Defensive methods used by fibre-optic



Close-up shot of the 26-kilowatt LOCUST laser weapon system at the back of the DE C-UAS Stryker. The long rectangular box (lower left) is the 2.75-inch APKWS rocket pod and the square slat-finned box (lower right) is Leonardo DRS’ next-generation multi-mission hemispheric radar (nMHR) (Photo: Leonardo DRS)



The kinetic and non-kinetic weapons on the DE C-UAS Stryker include the guns, Titan jammer, 360-degree situational cameras, AESA next-generation radars, and laser weapon system (Photo: Screenshot)

drones to mitigate communications signals are ineffective against LOCUST LWS, which can defeat Group 1, Group 2, and some Group 3 and larger air threats,” says Leonard DRS.

To defend against large drone swarms, the DE C-UAS Stryker also comes with an anti-drone jamming system. The prototype includes BlueHalo’s Titan RF C-UAS technology, which provides advanced threat detection and understanding to operators, at the speed they need for mission success.

Deployable within five minutes, hostile drones are identified and intercepted, ensuring aerial security. Titan C-UAS™ is an autonomous solution enhanced by an artificial intelligence/machine learning engine and designed to defeat Group 1 & 2 drones. Titan C-UAS™ and Titan-SV non-kinetic technologies equip the non-specialist operator with comprehensive 360° surveillance situational awareness and defensive measures to mitigate UAS threats.

Scott Boston, a senior defence analyst at RAND Corporation’s Army Research Center, says Leonardo’s next-generation multi-mission hemispheric radar (nMHR) is “pretty impressive”, with the ability to see 360-degrees and work while on the move. As an Active Electronically Scanned Array it is also more difficult to find while emitting. “The range of the nMHR is substantial against even very small targets. It’d be a good step to get a lot of radars like that out on the battlefield,” he says.

ARMIES NEED A MIX OF CAPABILITIES

With so many UAS threats of different types, Scott says armies need a mix of capabilities. “The electronic warfare, laser, cannon and APKWS mix seems like a good approach to me, but the network and sensor piece of this is really promising as well,” he adds.

Asked if the DE C-UAS Stryker can be fired remotely from outside the vehicle

at a distance, Leonardo DRS says the prototype is designed to support a three or four soldier crew inside the vehicle and weapons use a mix of controllers. According to Leonardo DRS, the weapons support the Army’s strategy to provide a layered defence against all air threats. “Each effector on the Stryker provides the vehicle commander with options on when to engage threats and with what effector.”

The C-UAS DE Stryker can also form part of a much larger Forward Area Air Defence Command and Control, which integrates short-range air defence, counter-rocket, artillery, and mortar, and C-UAS systems to detect and intercept incoming threats, warn affected personnel and determine point of origin. ■

ABOUT THE AUTHOR

Peter Ong is a US-based contributing journalist who writes for a number of defence and naval titles.

COMBAT PROVEN AIR PROTECTION

 **KORKUT** | 150/35
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SELF PROPELLED AIR DEFENSE GUN SYSTEM



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ASELSAN: PIONEERING EXCELLENCE IN AIR DEFENCE

ASELSAN

As global air defence challenges become increasingly sophisticated, safeguarding national airspace is now more critical than ever. ASELSAN, Türkiye's leading defence company, is at the forefront of this mission, offering comprehensive air defence solutions to its clients worldwide.

Leveraging nearly 30 years of expertise in air defence, ASELSAN delivers fully integrated systems encompassing the three pillars of modern air defence: advanced weaponry, cutting-edge sensors, and robust command and control capabilities.

ASELSAN's innovative approach spans designing, developing, and producing versatile air defence weapon systems adaptable to land, sea, and air platforms. Additionally, the company specialises in modernising existing air defence assets in military inventories to align with evolving operational demands.

ASELSAN's air defence portfolio includes groundbreaking projects such as KORKUT Self-Propelled Air Defence Weapon System, GÖKDENİZ Close-In Weapon System, HİSAR Low/Medium Range Air Defence Missile System, and GÜRZ Hybrid Air & Missile Defence System which integrate various calibres of weaponry and the ability to launch missiles and rockets to meet diverse air defence requirements.

Through these advancements, ASELSAN continues strengthening its position as a trusted partner in air defence, ensuring readiness against the threats of today and tomorrow.

KORKUT: MOBILE AIR DEFENCE FOR MODERN WARFARE

Specifically designed for mechanised and mobile units, KORKUT Self-Propelled Air Defence Gun System offers a highly effective solution for protecting troops on the move. In modern warfare, where mobility is crucial, KORKUT provides rapid, reliable air defence in dynamic combat situations. The system has firing on the move capability with a stabilised and unmanned gun turret. The KORKUT Gun System can fire 35 mm airburst ammunition in addition to conventional type 35 mm ammunition.

KORKUT highly improves the effectiveness of ground-based air defence against modern air threats including air-to-ground missiles, cruise missiles and UAVs. Its automatic linkless ammunition feed mechanism supports the simultaneous loading of High-Explosive Incendiary (HEI) and Airburst Ammunition, allowing instant switching to address specific operational requirements.



Its recently launched version equipped with 25 mm airburst ammunition, is primarily designed against armoured land targets, making it an ideal solution for integration onto tactical vehicles. KORKUT 25 mm stands out with its integrability on different land vehicles such as 4x4, 6x6, and 8x8 wheeled or tracked platforms.

GÖKDENİZ: REDEFINING CLOSE-IN DEFENCE

ASELSAN's GÖKDENİZ Close-In Weapon System (CIWS), coupled with its 35 mm airburst ammunition (ATOM), is designed to neutralise a wide spectrum of threats, including anti-ship missiles, helicopters, fighter aircraft, UAVs, and asymmetric naval surface threats. During field tests, the system, paired with ATOM ammunition, demonstrated superior range and lethality compared to conventional CIWS platforms.

The system offers multiple configurations to meet diverse operational needs. In its standalone configuration, GÖKDENİZ operates autonomously, equipped with a 3D surveillance radar

for detection, electro-optical sensors, and a fire control radar for precise target acquisition and tracking. Remarkably, it maintains full functionality even if the ship's Combat Management System (CMS) or sensors encounter failures. From radar to munitions, every component of GÖKDENİZ is developed using ASELSAN's cutting-edge technology, ensuring unparalleled performance and reliability against emerging maritime threats.

HİSAR: A VERSATILE AIR DEFENCE SOLUTION

ASELSAN's HİSAR family consists of two key variants: HİSAR-A, an autonomous short-range air defence missile system, and HİSAR-O, a medium-range air defence missile system. HİSAR-A offers an interception range of 15 km, while HİSAR-O extends this range to 25 km. With both mobile and stationary configurations, HİSAR systems provide exceptional flexibility in deployment, allowing them to be adapted for a wide range of tactical situations.

HİSAR-A is designed to protect mobile units, neutralising low-altitude aerial threats such as fixed-wing aircraft, rotary-wing aircraft, UAVs, and air-to-surface missiles. It can distinguish between friendly and hostile targets and perform efficiently in day and night operations and even under adverse weather conditions. It can engage multiple targets simultaneously, an advantage in scenarios with multiple threats and coordination with higher command structures.

HİSAR-O, on the other hand, is designed for defending critical infrastructure and fixed military installations. This system has an enhanced capability to protect against threats, including fighter jets, helicopters, UAVs, and cruise missiles. HİSAR-O allows for efficient deployment in various combat scenarios and combines infrared and radar-guided missiles to track and intercept multiple targets.

Together, HİSAR-A and HİSAR-O systems form a comprehensive air defence solution that meets both battlefield and strategic defence requirements, ensuring they are essential for any country looking to strengthen its air defence capabilities.



GÖKDENİZ



GÜRZ

GÜRZ: A MULTI-EFFECTOR AIR & MISSILE DEFENCE SYSTEM

GÜRZ Multi-Effector Air and Missile Defence System is a cutting-edge solution for the air and missile defence of both stationary and mobile units. It offers effective protection against a wide range of aerial threats at very low and low altitudes, including UAVs, helicopters, fighter aircrafts, supersonic cruise missiles, and supersonic air to ground missiles.

GÜRZ integrates several sensor subsystems to ensure superior target detection and tracking. It incorporates AESA search radar and an integrated tracking platform to provide comprehensive situational awareness. Additionally, the system is equipped with an Identification Friend or Foe (IFF) subsystem, ensuring that friendly units are easily distinguishable from potential threats. The system also features advanced communication subsystems, enabling seamless coordination with other friendly units to

maximize operational effectiveness. GÜRZ has ability to work as autonomous or as a member under a command&control unit.

The weapon subsystems of GÜRZ are equally impressive. The system includes a 35 mm air defence gun with airburst ammunition (ATOM), along with a range of missiles—four VSHROAD and four SHROAD missiles—designed for rapid engagement of hostile targets. Additionally, GÜRZ incorporates a soft-kill capability through an electromagnetic jammer, offering a multi-layered defence approach.

GÜRZ is built with a modular, open architecture, allowing for the easy addition of new features and capabilities as operational needs evolve. This flexibility is further enhanced by the system's ability to operate in various environments, including day/night operations and adverse weather conditions. With a “hide-fire-run” capability, GÜRZ can relocate rapidly using an 8x8 tactical wheeled vehicle, making it ideal for mobile defence operations. ■

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On 29 October 2024, KNDS handed over the first of 17 Leopard 2A7A1 MBTs to the Bundeswehr during a roll-out ceremony in Munich (Photo: Ralph Zwilling)

TROPHY BOOSTS BUNDESWEHR'S TANK DEFENCES

Alongside firepower and mobility, protection has always been one of the three most important design criteria for main battle tanks. In recent years, the increasing number of ever cheaper hand-held anti-tank weapons and long-range anti-tank guided missiles has given new impetus to the development of modern combat vehicles.

Conventional armour would have to be significantly reinforced to meet this

threat. However, this inevitably leads to higher weight and bulkier armour. To avoid this dilemma, tried-and-tested stand-off protection systems from a wide range of manufacturers are now available. In most cases, electronically controlled radars permanently monitor the vehicle's surroundings and detect approaching objects. High-performance computers classify the approaching objects and automatically decide whether

The Leopard 2A7A1 rolls out with the Trophy APS, setting new protection standards for Germany's land forces.

By Ralph Zwilling

the type of object and its trajectory pose a threat to the vehicle. If this is the case, a countermeasure is triggered to defeat the object.

In 2007, KNDS was first approached to investigate the possibility of integrating an active protection system such as Raphael's Trophy Active Protection System (APS) on the Leopard 2 tank. The initial focus was on the Leopard 2A4, as this was the main battle tank with the lowest level of protection. The situation became even more urgent when Turkish Leopard 2A4 MBTs were successfully engaged and destroyed with top attacks as part of Operation Euphrates Shield in Syria in 2016.

Construction of a demonstrator followed in 2017, and two years later, the first successful demonstration took place at the Kliezt military training area. In February 2021, the Bundeswehr concluded the series contract to equip 17 Leopard 2s from its existing fleet with the Trophy APS. These vehicles were designated Leopard 2A7AI. In addition, the Leopard 2 VT-ETB, which serves as a reference vehicle for the Federal Office of Bundeswehr Equipment, Information Technology and In-Service Support, will also be equipped with the Trophy system and designated Leopard 2 VT-EBT II after retrofitting.

NO COMPARABLE SYSTEM IN THE GERMAN LAND FORCES

Integrating the Trophy APS on the Leopard 2, meant the entire turret needed to be redesigned. Adjustments were made to the hull to accommodate sensors, cabling and protective panels. The

turrets with built-in Trophy systems are married to chassis that KNDS redesigned specifically to accommodate the additional 20 kW power generation system. On March 29, 2022, KMW (now KNDS), General Dynamics European Land Systems and Rafael Advanced Defense Systems founded EuroTrophy, based in Frankfurt, which offers the Trophy system to customers from NATO and EU countries.

The roll-out of the first Leopard 2A7AI MBT for the Bundeswehr was on 29 October 2024 at KNDS in Munich. The first Leopard 2 A7AI will be handed over to the German Army in the first half of 2025 after upcoming trials are completed. The other 16 vehicles will be available to the Bundeswehr by the end of the year.

According to many high-ranking German officers, the Leopard 2 A7AI fitted with the new Trophy system, is a milestone for the Bundeswehr. There is no comparable system in the German land forces. What clinched the procurement was the fact

that the Trophy system was already successfully deployed with the Israeli Defense Forces since 2011 and had proven its worth in combat operations there.

The Trophy system improves protection in every possible situation on the battlefield without taking away the main battle tank's agility. The tank can move more freely, without being at the mercy of anti-tank gunners at close range or combat helicopters from concealed positions. With the help of the Trophy stand-off protection system, incoming projectiles and guided missiles can be rendered harmless in fractions of a second before they hit the tank's armour.

HOW THE TROPHY APS WORKS

The Trophy APS basically consists of four ELM-2133 WindGuard radar sensors from Israel Aerospace Industries at the corners of the turret, two launcher units attached to the sides of the turret and a



The rear of the hull has some similarities with the Leopard 2A7V already fielded with the Bundeswehr (Photo: Ralph Zwilling)

high-performance computer. According to reports, each launcher covers more than 180 degrees, ensuring 360-degree protection. The detection and suppression process runs automatically. The control units with interfaces to the fire control system, the battle management system and the power supply are integrated in the turret and the hull.

Together with the high-performance computer, they form an invisible shield around the main battle tank. By integrating the Trophy APS into the main computer and the BMS of the Leopard 2, the Fire Source Location was realised. This ensures the threat is localised and transferred to the BMS. This allows observation devices and weapons to be automatically directed at the threat for immediate engagement. Crew can return fire and destroy the enemy before they can continue firing at the tank. By sharing the targeting data generated by the Trophy APS with other combat systems, additional accurate situational awareness is provided to units using the Trophy APS.

The Trophy APS works completely autonomously and is only activated or deactivated by the commander. A special feature is the speed of the system. The four Active Electronic Steering Area ELM-2133 WindGuard radar sensors continuously scan their surroundings and detect anything approaching the combat vehicle. If the Trophy evaluation and fire control electronics detect a threat such as an approaching enemy anti-tank guided missile, the high-performance computer uses the detected trajectory to calculate whether it is likely to hit the main battle tank.

The radar also tracks the flying object and continuously measures all its parameters such as azimuth angle, elevation angle, speed and distance and calculates the time to impact and the launch point. If the Trophy system determines that the anti-tank guided missile is a threat to the tank, it decides which of the two launchers should intercept the threat



The Trophy launcher on the left side of the turret. Note the two new launchers of the 76 mm smoke discharger system integrated in the Trophy launcher box (Photo: Ralph Zwilling)

and automatically triggers an alarm for the crew. The selected launcher fires its charge into the predicted trajectory of the approaching missile and detonates it prematurely before it hits the vehicle. The missile loses a large part of its destructive effect and is no longer able to penetrate the tank's armour. The entire process of intercepting approaching objects occurs within milliseconds if the tank is fired at, at close range.

Passive armour protection is still required, even in the event of successful engagement, as parts of the destroyed projectiles continue to affect the tank with their residual energy.

In terms of armament, the Leopard 2A7AI is fitted with the new 120 mm L/55AI smoothbore gun, including new breach blocks, barrel brakes and recuperator mechanisms for higher gas pressure. The 76 mm smoke discharger system was also modified. There are

now six launchers on each turret side armour plate and two further launchers on the front of the launcher unit. A new digitalised control system for the electric weapon tracking system and a new commander's monitor were installed.

The Leopard 2A7AI is an intermediate technological step that will enable the Bundeswehr to introduce this cutting-edge technology to troops at an earlier stage. The experience gained with the Leopard 2A7AI and its Trophy APS will then be transferred to the Leopard 2A8. ■

ABOUT THE AUTHOR

Ralph Zwilling has authored numerous reports and books for military publishers and magazines as a freelance journalist and photographer. He is best known for his knowledge about the Stryker Interim Armored Vehicle and often photographs US Army Europe and other NATO Armies training exercises.



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GULF COUNTRIES SPEND **BIG** ON BALLISTIC MISSILE DEFENCE

The Middle East has emerged as a crucible for combat testing of ballistic missile defence systems.

By Atul Chandra

Ballistic Missile Defence (BMD) as a deterrence strategy is living up to its promise, especially in the Middle East. The region is unique in the continued proliferation of ballistic missiles, including long-range variants operationalised by Iran, Israel, Egypt, Turkey, Saudi Arabia, Yemen, Syria, the UAE, Qatar and Bahrain.

The ability to defend against ballistic missile strikes on city centres, heavily populated areas and strategic military targets has an outsize impact on national morale, justifying the heavy expenditure in operationalising BMD systems.

As a result, the Middle East has emerged as a vital proving ground for BMD systems

in combat conditions, with Saudi Arabia, the UAE and Qatar having invested heavily in such systems along with Israel. Billions of dollars worth of US BMD systems and associated infrastructure were operationalised by Saudi Arabia, the UAE and Qatar, with the former two operating Patriot-guided Air And Missile Defence (AMD) systems and Terminal High Altitude Area Defence (THAAD) systems. Qatar uses Patriot-guided AMD systems. As part of Qatar's Shield 5 Missile Defence Project, six missile defence sites are being constructed supported by a 360-degree radar to track ballistic missiles.

Saudi Arabia has pursued a missile defence capability since the 1991 Gulf



The Royal Saudi Air Defence Force will have seven THAAD batteries by 2028 (Photo: Lockheed Martin)



An image rendering showing Lockheed Martin's Terminal High Altitude Area Defence (THAAD) launcher with eight canisters (Photo: Lockheed Martin)

War, when Patriot missile defence systems on Saudi soil were deployed against Iraqi Scud ballistic missiles, which marked the first combat use of BMD systems as we know them today. Saudi Arabia continues to use its Patriot systems to defend against persistent cross-border ballistic missile and unmanned aerial system attacks by Yemeni Houthi rebels on its civilian sites and critical infrastructure.

INTERCEPTING HOUSHI-LAUNCHED BALLISTIC MISSILES

The UAE emerged as the first THAAD international customer in 2011, followed by Saudi Arabia in 2018. THAAD's exo-atmospheric, hit-to-kill capability adds

an upper tier to existing layered missile defence systems.

Joseph Rank, Lockheed Martin's chief executive for Saudi Arabia and Africa says THAAD is a highly effective, combat-proven defence against short, medium and intermediate-range ballistic missile threats. Designed for endo- and exo-battlespace, it provides significant mass raid capability. Rank says THAAD's unique layered defence capabilities continue to drive strong interest in the Middle East, Asia Pacific and Europe.

As of January 2024, two THAAD batteries were fully operational with the UAE. Their successful interception of Houthi-launched ballistic missiles in January 2022 marked the BMD system's

first operational intercept in a combat environment by any nation.

The Royal Saudi Air Defence Force will receive seven THAAD batteries, with the first four slated for completion by the end of 2026 and the remaining three to be ready by April 2028. The US is slated to operationalise its eighth THAAD battery this year. Each THAAD battery includes five major components: eight interceptors per launcher, up to 18 launchers per battery, an AN/TPY-2 THAAD radar, a tactical station group and support equipment. Raytheon announced the first AN/TPY-2 missile defence radar for delivery to Saudi Arabia in September 2023.

The Patriot remains the pre-eminent mobile air and missile defence system

in the region. It made its debut in the Middle East more than 30 years ago. Operators in the region include Saudi Arabia, UAE, Qatar, Kuwait, Israel and Turkey. The latest PAC-3 Missile Segment Enhancement (MSE) versions feature a dual-pulse rocket motor and use hit-to-kill technology delivering exponentially greater kinetic energy against tactical ballistic missile, cruise missiles, hypersonic, and aircraft targets than can be achieved with blast fragmentation.

Lockheed Martin is also accelerating production to meet strong demand from East Asia, the Middle East and Europe for PAC-3 MSEs. In June and November of 2024, it received orders from the US Army for 870 and 650 PAC-3 MSE interceptors, respectively. Lockheed Martin is expanding PAC-3 MSE production capacity, with output growing by 30% in 2024, with an additional 20% production increase planned for 2025. PAC-3 MSE production in 2024 exceeded 500 interceptors for the first time, a new production record.

LOCALISATION IMPERATIVES

Saudi Arabia will be the first country outside the United States to manufacture THAAD components. “To date, Lockheed Martin has partnered with local industry for co-production of key defence articles, expanded cutting-edge technology in

additive manufacturing, and is establishing long-term support and repair capability in the Kingdom,” says Rank. Saudi Arabia’s local defence industry received two subcontracts from Lockheed Martin in February 2024 to manufacture the THAAD interceptor canister and missile round pallet.

In April 2024, Saudi Arabia’s General Authority for Military Industries announced that it would undertake in-country manufacturing and testing of key Patriot air defence system components. The Patriot missile launcher will be produced by Arabian International Company for Steel, and GEM-T missile canisters will be manufactured by Zahid Industries. Final assembly, integration, and testing of Patriot GEM-T effectors will be undertaken by Saudi Arabian Military Industries. Greater efforts are also being made to maintain and repair critical Patriot components in Saudi Arabia.

While the US, Russia and Israel have some of the most capable and combat-proven BMD systems, South Korea is rapidly emerging as a contender in this space. The South Korean firm LIG Nex1’s KM-SAM Block II (Cheongung II) air defence system, which also engages ballistic missiles, was ordered by the UAE, Saudi Arabia and Iraq.



South Korea is a new export contender in the BMD arena, with export contracts from the UAE, Saudi Arabia and Iraq for its Cheongung-II (KM-SAM Block II) weapon system (Photo: Hanwha Systems)

The UAE emerged as the first export customer for the KM-SAM Block II with a \$3.5 billion deal signed in January 2022. It was followed by Saudi Arabia, which placed an order worth \$3.2 billion in November 2023, and Iraq, which is the most recent customer with a September 2024 deal worth \$2.6 billion. In July 2024, Hanwha Systems announced that Saudi Arabia had ordered Multi-Function Radars for its Cheongung-II systems worth \$867 million. The UAE deal for the same radars was worth \$1.1 billion.

EMERGING BMD CONTENDER

The Cheongung-II MFRs exported to the Middle East feature an Active Electronically Scanned Array for improved detection and tracking performance and have been modified to operate in extreme desert conditions. LIG Nex1, the main contractor for the KM-SAM Block II, supplies the missile interceptors, while Hanwha Systems supplies the radar. Hanwha Aerospace produces the Transporter, Erector and Launcher. A KM-SAM Block-II battery comprises four mobile launchers, each carrying eight missiles, a Multi-Function Radar and an engagement control centre. The KM-SAM Block II is used as a mid-tier interceptor, complimenting the Patriot Advanced Capability-3 (PAC 3) interceptors used against low-level threats and THAAD for medium to high-altitude threats.

BMD systems have proven their utility in recent conflicts and lived up to their potential. While costly to procure, operate and maintain, their usefulness is well demonstrated in multiple locations across the Middle East. With the region in the throes of rebalancing centres of power and experiencing growing uncertainty, continued investments in national BMD networks are all but a foregone conclusion. ■

ABOUT THE AUTHOR

Atul Chandra is an Indian aerospace and defence journalist.



OPINION

RETHINKING MISSILE DEFENCE IN A CHANGING THREAT LANDSCAPE

Is the UK, and Europe, ready for the next phase of missile warfare?

By Andrew Brookes

The Air Defence of Great Britain (ADGB), comprising substantial army and Royal Air Force elements, was responsible for the air defence of the British Isles from 1925 until 1936, when it became RAF Fighter Command. ADGB was resurrected in 1943 to defend the UK, and within a year the first V-2 ballistic missile fell on London.

Fast forward 80 years, last April, the US and its allies shot down 99% of 550-odd projectiles fired by Iran and Hezbollah in a single night. It was probably the largest single missile barrage in history. Since then, politicians have been asking how to improve defences against attacks from the air.

Before Donald Trump became the Republican nominee for his second term as US president, the party

proclaimed three foreign policy goals: “Prevent World War Three, restore peace in Europe and the Middle East, and build a great Iron Dome missile defence shield over our entire country.” Yet comparisons with Israel’s Iron Dome system are unhelpful.

The UK is 11 times larger than Israel and has 75 cities with a population of more than 100,000, whereas Israel’s cities are concentrated in a compact area. How big a missile defence system is needed to protect the nearly 600 million citizens of NATO countries in Europe? As retired Air Marshal Greg Bagwell wrote after the 2024 attacks: “We have yet to wake up to our vulnerability, or truly imagine what it means to be under attack in [our] own homeland — we have become complacent at best, and reckless at worst”.

A new and undefined phase

The UK’s Integrated Air and Missile Defence (IAMD) has been a major deficiency for decades. The Defence Command Paper Refresh in 2023 acknowledged that “The challenge of protecting ourselves against attack from the skies, both overseas and at home, is at its most acute for over 30 years...” It implied that the Ministry of Defence would “step up efforts to deliver an [IAMD] approach”.

Yet missiles are constantly evolving, becoming more manoeuvrable and harder to intercept. Talk of domes and shields suggests one system will counter all aerial threats. Air and missile defence increasingly consists of interlocking elements. Multiple sensors detect drones and missiles while increasingly sophisticated computers crunch data to work out intercept geometry. The results are fed into intercepting weaponry, which attempts to defeat the threat, usually by colliding with or exploding next to it. Defences are thus ‘layered’ to counter differing ranges, speeds, and trajectories.

None of which comes cheap. Each Patriot battery costs around \$1.1 billion (while the cost of a single missile is estimated to be \$4.1 million (€3.8 million). Intercepting a ballistic missile warhead on its final approach, with speeds of up to 7 km a second, underlines the dilemma of taking out a relatively cheap Iranian drone with

a comparatively expensive interceptor. It is estimated that building a layered missile defence for Guam, a strategically important US island base in the Pacific Ocean that is vulnerable to Chinese missile attacks,



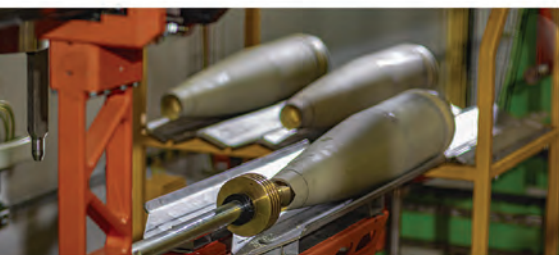
Before Donald Trump became the Republican nominee for his second term as US president, the party proclaimed three foreign policy goals: “Prevent World War Three, restore peace in Europe and the Middle East, and build a great Iron Dome missile defence shield over our entire country.” Yet comparisons with Israel’s Iron Dome system are unhelpful.



would cost around \$5 billion. The Ukraine and the Middle East have witnessed new types of offensive projectiles,



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from small drones to long-range hypersonic missiles and countering technologies for knocking them out of the sky. There is a need for a new generation of sensors and interceptors, but the price tag will be enormous. IAMD will have to be done economically, especially as the missile threats get cheaper, more accurate and more easily acquired by smaller countries and armed groups.

NATO countries will find that, like Ukraine, they will be forced to choose between protecting their civilians, critical infrastructure, military bases, or frontline

troops. The race between missile and interceptor is entering a new, and in many ways, undefined phase.

European Sky Shield

The European Sky Shield Initiative (ESSI) aims to build a ground-based integrated European air defence system, which includes an anti-ballistic missile capability. Originally proposed by German Chancellor Olaf Scholz in August 2022 following Russian strikes against Ukrainian infrastructure, ESSI reflects increased concerns about Europe’s limited ability to

defend itself against threats such as the Russian 9K720 Iskander ballistic missile system deployed in Kaliningrad. As of July 2024, 22 European states participate in the ESSI.

The ESSI will use multi-layered defence, with the following systems planned:

- Short range: Skyranger 30
- Medium range: primarily IRIS-T SLM
- Long range: MIM-104 Patriot
- Very long range (exoatmospheric) Arrow 3.

In November 2024, the European Commission approved funding for five

cross-border projects to support more coordinated and efficient defence procurement among EU member states.

Two projects are designed to bolster joint air and missile defence capabilities. The first supports the common procurement of the “Mistral” short-range air defence system. The second, “JAMIE” (Joint Air Missile Defence Initiative in Europe), will result in the common procurement of IRIS-T SLM medium-range air defence systems for protection against air threats such as combat aircraft, attack helicopters and unmanned air systems.

Making Europe safe from air attacks is immense and will take years. This is more than the Battle of Britain 2.0. If you can’t operate in a denied environment, you can’t operate at all. European nations must form a common front, both in terms of command and control and industrial mobilisation.

The old Latin dictum that to ensure peace, you must prepare for war applies more than ever. Europe should aim to maximise frontline military power but also maintain the ability to mobilise power (military and industrial) more effectively than any rival can manage. Those in charge of the UK’s latest Strategic Defence Review and designing ESSI would do well to remember that.

Andrew Brookes is a Fellow of the Royal Aeronautical Society and a former RAF pilot. He was the last operational commander at the Greenham Common cruise missile base.



A US Army Patriot launcher from 5th Battalion, 7th Air Defence Artillery Regiment deployed in Southeast Poland (Photo by Capt. Leara Shumate)



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THE COMPREHENSIVE 60MM COMMANDO SYSTEM

Developed by Hirtenberger Defence Systems (HDS), the M6 C is composed of a commando mortar, a sighting unit, field-level equipment and a custom-made range of mortar ammunition for paratroopers, commando soldiers and special forces.

The world of commando mortars is about to be revolutionised by the integration of an electronic aiming and calibration device, known as the GRid Aiming Mode (GRAM). This technological breakthrough will deliver greater range whilst enhancing precision and reducing ammunition usage. As well as saving time and money, the GRAM enables additional, more flexible deployment procedures.



A TAILOR-MADE APPROACH TO ARTILLERY

Yugoimport-SDPR

Yugoimport-SDPR was founded 75 years ago as a state-owned company fully authorised and supported by the government to deal in the foreign trade of armament and defence equipment.

The one thing that has not changed from the early beginnings to the present day is the quality of the products and services that Yugoimport-SDPR can offer customers and end users. The quality of the material and our tailor-made approach to customers is key to the rock-solid foundations of the company.

In recent years, Yugoimport-SDPR has not only shown steadfast determination to come to grips with new development

and manufacturing projects but has also endeavoured to introduce innovations through new techniques and software solutions in different fields for managing and improving its business activities.

Yugoimport-SDPR has concentrated its efforts on the development and serial production of new defence products, focusing primarily on complex combat systems, including self-propelled artillery and artillery rocket systems MLRS in the formation of artillery battalions. Most of these new products are already part of the Serbian Armed Forces as well as various armed forces all over the world.





We are particularly proud of the Nora artillery system that joined global players in the field of artillery in the early 2000s, which makes us a completely equal competitor to the world's leading manufacturers. The latest generation of this system — the **Nora B52 NG**, with an increased quantity of projectiles in the automatic loader ready for fire, is the most powerful, fully automated fire support artillery weapon in cal. 155 mm, with an increased level of protection, keeping the most beneficial characteristics of the **Nora B-52 M21**, including very high reliability in different demanding environmental conditions — on all types of ground, in all climatic-mechanic conditions (sunshine, rain, snow, high humidity, high sand concentration), by day and night, in all visibility conditions; full back up and wide elevation and traverse angles, in both directions.

The weapon was made through an integration of a 155 mm weapon module on an 8x8 chassis. The weapon module is controlled from the vehicle cabin and, owing to its characteristics,

can be regarded as a 155 mm RCWS. The weapon module is built around a 155 mm autofrettaged barrel assembly that is JBMOU-compliant.

The barrel is 52 calibres with a powder chamber of 23 litres. It provides fire support with intensive, sudden and rapid fire on targets of tactical, operational and strategic importance at long distances. The weapon module is a fully automatic loader with 30 projectiles and propellant charges. An additional six rounds are accommodated on the platform for automatic reloading, so the combat set comprises a total of 36 rounds.

The Yugoimport-SDPR scope of offer refers to all products that support the deployment of such artillery systems: FCS, Fenix, supportive vehicles, and 155 mm artillery ammunition with an increased range of 40+ km, which is developed and produced in Serbia and is fully in compliance with NATO standards; all types of powders — single-base and double-base, propellants, and composite propellants. ■



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ARQUUS

ADVANCING MORTAR SYSTEMS FOR MODERN OPERATIONS

ST Engineering

In the modern operational environment, military forces face increasingly complex battlefields, characterised by hybrid threats that combine conventional and irregular tactics.

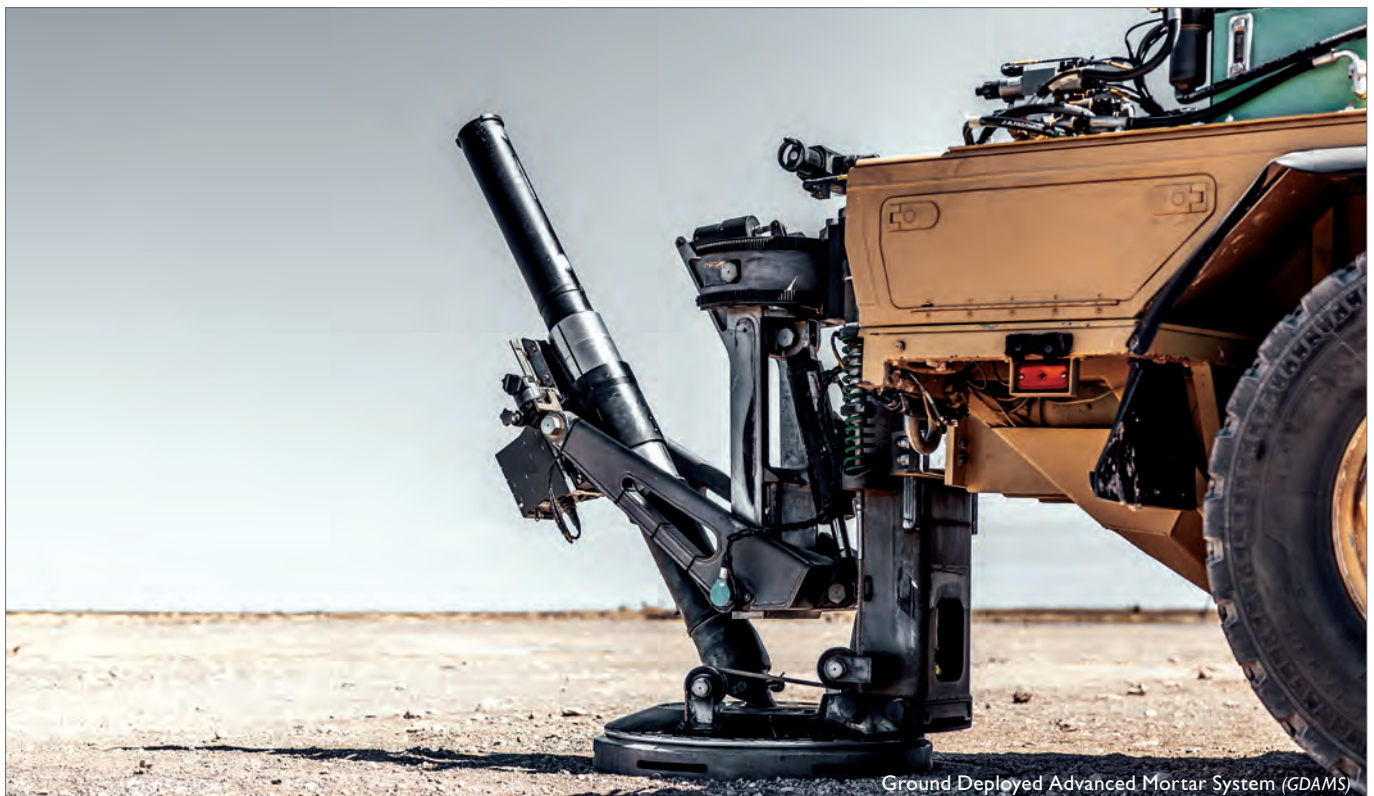
These require adaptable, efficient, and highly lethal systems. Mortar systems, a key element of artillery and fire support, have evolved to meet these demands, providing commanders with enhanced capabilities integrating speed, precision, and operational flexibility. A notable advancement is the 120 mm Ground Deployed Advanced Mortar System (GDAMS), a next-generation solution designed to deliver precision indirect fire while enhancing the agility and survivability of ground forces.

The 120 mm GDAMS, developed by ST Engineering, marks a crucial leap in mortar technology. This system builds on the

proven capabilities of legacy mortars, such as the 81 mm and 120 mm mortars, while integrating cutting-edge technology and advanced design principles. With a focus on modularity, speed, and lethality, the GDAMS addresses modern operational challenges, from rapid deployment and operational readiness to precision targeting and force protection.

THE EVOLUTION OF MORTAR SYSTEMS: FROM LEGACY TO THE FUTURE

Historically, mortars have provided essential indirect fire support, enabling forces to engage targets concealed behind obstacles or at long ranges without a direct line of sight. The shift from older systems like the 81 mm mortar and 120 mm mortar



Ground Deployed Advanced Mortar System (GDAMS)

to the 120 mm GDAMS reflects the need for more accurate, and flexible platforms that engage a wider range of targets in diverse environments. This transition aligns with the broader trend towards more vehicle-agnostic, rapidly deployable mortar systems, supporting operations across multiple warfare domains.

The 120 mm GDAMS is a key development in this regard. Its ability to integrate with commercial and military vehicles, combined with its lightweight yet durable construction, makes it adaptable to varying operational requirements. GDAMS enables forces to suppress enemy positions, neutralise threats in hard-to-reach areas, and deliver effective counter-battery fire against hostile artillery.

The partnership between ST Engineering and Babcock, a leader in systems integration, enhances GDAMS' capabilities. Built in the UK, the GDAMS represents the first 120 mm mortar system manufactured in decades, marking a significant industrial and operational milestone. This collaboration enables ST Engineering to offer a complete, end-to-end solution for GDAMS, including design, manufacturing, operational support, and training. UK-based production ensures regional availability, operational readiness, and sustainability for military forces across Europe and beyond.



GDAMS is manufactured at Babcock's production facility in Devonport, United Kingdom

RAPID DEPLOYMENT AND TACTICAL ADVANTAGE

In modern warfare, speed and flexibility are crucial. GDAMS is designed to meet these demands, offering rapid deployment and

operational responsiveness across battlefield scenarios. Whether mounted on a 4x4 military vehicle or a lightweight commercial vehicle, the system offers maximum flexibility for commanders, enabling quick adaptation to rapidly changing conditions.



Platform agnostic: Compatible with any lightweight commercial or 4x4 military vehicle

The GDAMS features a modular barrel design that supports 81 mm and 120 mm munitions, ensuring compatibility with legacy systems while delivering the enhanced firepower and performance of next-generation platforms. Its elevating angle, ranging from +45 to +80 degrees, and ± 90 -degree traverse allow it to engage targets at different angles, making it effective in offensive and defensive operations.

The system can be deployed and operational in 15 seconds, providing a rapid response to emerging threats. This ability to shoot and scoot — fire and reposition quickly — ensures the system remains mobile, a key advantage in modern combat where counter-battery fire and enemy detection are constant threats. GDAMS can stow just as quickly, ensuring that crews stay mobile and avoid being targeted after firing. This flexibility significantly enhances operational tempo, allowing forces to maintain the initiative in fast-paced engagements.

Crewed by just two personnel, the GDAMS reduces manpower requirements compared to traditional mortar systems. This streamlined configuration helps ease logistical burdens while maintaining the necessary firepower to accomplish mission objectives.

PRECISION AND INTEGRATION: ENHANCING LETHALITY AND MINIMISING COLLATERAL DAMAGE

The 120 mm GDAMS integrates advanced fire control systems and GPS-guided munitions for unmatched precision on the battlefield.



Two-person crew operation, significantly reduces manpower requirements

process into a series of chambers, diverting them away from the crew and reducing the risk of injury caused by pressure and gas build-up.

The blast diffuser protects personnel and reduces the system's noise signature, making it less detectable by enemy forces. This capability is particularly valuable in counter-battery operations, where minimising the

With real-time data sharing via command-and-control networks, GDAMS enables pinpoint strikes on high-value targets while minimising risks to non-combatants and friendly forces. This precision is crucial in manoeuvre warfare, where timely target destruction can decisively impact engagements.

Its integration with networked systems further enhances effectiveness in the digital battlefield, allowing GDAMS to rapidly identify, track, and engage targets with exceptional accuracy. This synchronisation supports collaborative targeting and faster decision-making, ensuring seamless integration into modern joint operations.

SAFETY AND SURVIVABILITY: PROTECTING THE CREW AND ENHANCING OPERATIONAL SUSTAINABILITY

While the 120 mm GDAMS delivers high lethality and precision, it also prioritises the safety of its crew — an essential consideration in high-intensity combat scenarios. A standout feature of the system is its patented blast diffuser technology, which significantly improves crew protection during operations. This innovative system channels combustion gases from the firing

noise generated by artillery is critical to avoiding detection and retaliation. By reducing noise and gas exposure, GDAMS enhances operational survivability and crew well-being, allowing units to operate effectively under high-intensity conditions.

GDAMS IN TOMORROW'S BATTLEFIELD

The 120 mm GDAMS marks a major advancement in mortar technology, offering a highly adaptable, high-performance solution for modern military operations. As armed forces shift towards more mobile, flexible, and precision-focused capabilities, GDAMS plays a crucial role in supporting manoeuvre warfare, countering hybrid threats, and ensuring rapid responses to emerging battlefield conditions.

With its precision, mobility, and modularity, GDAMS enables forces to modernise without replacing legacy systems. Its integration with advanced fire control technology ensures it remains at the forefront of battlefield capabilities. As defence needs evolve, GDAMS delivers the agility, adaptability, and lethality necessary to stay ahead of future threats, ensuring forces remain prepared in an unpredictable world. ■



Patented blast diffuser reduces noise exposure, minimising auditory signatures

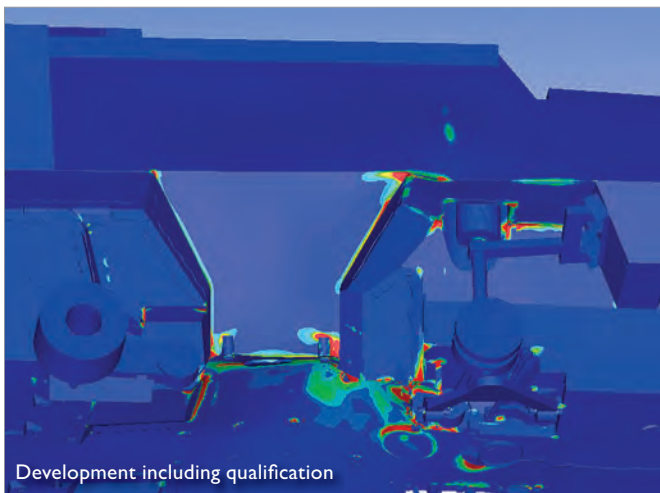
CHALLENGES WITHIN THE MODERN THREAT LANDSCAPE — BALLISTIC PROTECTION IN A DYNAMIC WORLD

RUAG

The security requirements of modern armed forces and emergency personnel reflect modern threat scenarios increasing complexity and dynamism.

For a long time, ballistic protection has been more than just a defensive measure – it is a strategic component of modern security concepts. With increasing threat diversity and the need for flexible, mobile, and functional solutions, the requirements placed on protection systems are also increasing. RUAG, a leading provider in this field, is tackling these challenges with innovative, technologically advanced, and future-oriented solutions.

These challenges include the increasing diversity and unpredictability of modern threats, the need to make protection systems lighter, and the demand for flexible and scalable solutions that can adapt to different deployment scenarios – always with the goal of guaranteeing the highest level of security and efficiency.



Development including qualification

THE CENTRAL CHALLENGES

1. Threat diversity

Conventional projectiles remain a major danger, however, hybrid warfare is increasingly generating complex threat scenarios: ranging from roadside bombs and improvised explosive devices (IEDs), to drone attacks with explosive devices. This

blend of different threats requires versatile protection systems that mitigate all anticipated threats.

2. Weight and mobility

For mobile armed forces, the weight of protection systems is a decisive factor. While steel offers universal robust protection, it significantly restricts mobility and load-carrying capacity. Lightweight composite materials within multilayered systems, combining protection and portability, are therefore essential.

3. Adaptability to deployment scenarios

Protection requirements vary depending on the area of deployment. Urban operations require different solutions to operations on open terrain, which are exposed to heavy fire. Combining modular protection systems without complete replacement offers a clear advantage here.

4. Long service life and ease of maintenance

Customers expect long-lasting protection solutions. At the same time, maintenance must be simple and efficient to minimise operating costs. Here, innovative designs and materials play a key role.

SOLUTIONS FROM RUAG

RUAG combines cutting-edge technologies with advanced research to develop protection systems that meet the highest requirements for protection, mobility, and flexibility. The portfolio includes systems that provide units with comprehensive and deployment-specific protection.

MODULAR PROTECTION SYSTEMS AND COMPREHENSIVE PRODUCT PORTFOLIO

The systems are characterised by their modularity. Vehicles can be equipped with basic configurations and, if necessary, expanded with modules to fend off specific threats such as RPGs or IEDs — without replacing the entire system.

RUAG offers a comprehensive range of protection systems tailored to the diverse requirements of modern armed forces.

LONG-TERM RELIABILITY

The protection solutions from RUAG are designed for extreme deployment conditions. They combine robustness with simple maintenance, thus minimising long-term operating costs.

ROOF PROTECTION AGAINST CLUSTER AMMUNITION

To protect armoured vehicles against artillery bomblets, RUAG developed the RoofPRO system, which can be integrated into existing vehicles. The system is designed to guarantee substantial protection, without impairing the vehicle functionality.

- **RoofPRO:** The unique RoofPRO roof protection offers a high protective effect against multiple hits, without impairing vehicle functionality. It can be adapted to almost any vehicle structure and is characterised by its low weight.

SIDE PROTECTION

For the side protection of armoured vehicles, RUAG developed the SidePRO systems. Depending on the system, the completely passive protection solutions can be integrated into the vehicle structure or retrofitted as an add-on solution. All SidePRO systems are scalable and can be tailored to customer requirements and to anticipated asymmetrical or symmetrical threats.

- **SidePRO-LASSO:** This system is the lightest system to protect against the widespread use of anti-tank grenade launchers within the RPG-7 family. It is characterised by high protective coverage, effective multiple-hit protection, and low weight. Flexible mounting enables the retention of vehicle functionality, including the use of doors and hatches.

- **SidePRO-RPG:** Suitable for medium and heavy vehicles, this system provides effective protection against RPG-7s and similar threats. It offers the highest level of effectiveness and multiple-hit protection in a passive protection system.

- **SidePRO-KE:** A passive, multi-functional combined protection system against armour-piercing projectiles, improvised explosive devices, artillery splitters, and explosively formed penetrators.

- **SidePRO-ATR side protection:** The protection system is for armoured personnel carriers and battle tanks. It guarantees effective protection against anti-tank missiles, guided missiles, large and medium-calibre KE projectiles, and large improvised explosive devices (IEDs). The advantages of this system lies in the high protective action against multiple hits. Its modular construction enables retrofitting and integration.

PROTECTION AGAINST MINES

To protect armoured vehicles against mines, RUAG designed the MinePRO system. The system protects against improvised explosive devices (IEDs), anti-tank mines, and explosive-formed projectiles. Retrofitting in legacy vehicles requires comprehensive adjustments to the vehicle interior.

- **MinePRO:** Systems to protect against mines and explosive-formed projectiles.

“The effective, and in some cases unique ballistic protection solutions from RUAG offer all-round protection against the most varied of threats, ensuring the survival of the respective team, and laying the foundation for successful deployments. Armed forces units trust in our ballistic solutions,” says Anthony Rossi, head of product management ground at RUAG.



Mine protection: MinePRO

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Side protection: sidePRO-LASSO

REFERENCE EXAMPLE: PROTECTION OF THE BELGIAN ARMY'S PANDUR I 6 X 6 FLEET

RUAG developed a tailored solution for the Belgian Army's Pandur vehicles. This offers 360-degree protection against various types of munitions, grenades, anti-tank missiles, booby traps, and mines. Special attention was paid to the ergonomics in the vehicle interiors, including modern mine protection seats. The modernisation has been implemented for all vehicle variants (reconnaissance, maintenance, and ambulance vehicles) and guarantees comprehensive protection for future deployments.

Nowadays, ballistic protection is much more than just a defensive measure — it is a strategic tool that has a crucial impact on the security and effectiveness of modern armed forces. With innovative, flexible, and effective protection systems, RUAG has established itself as a leading provider. The solutions combine protection,

mobility, and technical integration, and offer customers a crucial advantage within an increasingly complex security landscape. ■

Video QR Code: <https://youtu.be/6gwZVr3aa2E>

More information on the ballistic protection solutions Ballistic protection for armored vehicles | RUAG.

**Contact: Anthony Rossi,
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Ground, RUAG AG
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Website: www.ruag.ch/protection**



Side protection: SidePro-KE

DEFENCE TECH INVESTMENT SURGES IN DRONE WARFARE

Drone start-ups are the hottest investment ticket right now. We speak with three founders, and their investors, about how their technologies are advancing amid the wars in Ukraine and Gaza.

By Anita Hawser

“Investing in defence, is the right thing to do,” says Yaron Kniajer, managing partner & co-founder at Surround Ventures, a venture capital firm that invests in early-stage Israeli tech start-ups.

Kniajer’s first venture in the defence sector came in 2022 via its investment in Israeli drone company, XTEND, which emerged from the worlds of FPV (first-person view) drone racing and VR (virtual reality) to build AI-driven precision strike and tactical drones that reduce training time for Israel defence forces.

Historically, investors weren’t keen to invest in defence start-ups because of long sales cycles and “unattractive exits”. However, the wars in Ukraine and Gaza have sped everything up, says

Aviv Shapira, the CEO of XTEND which secured its latest Series-B \$40 million funding round in May 2024, amid Israel’s war against Hamas in Gaza.

“There is more money right now for fundraising than ever before,” says Shapira. The war in Gaza has not only made it easier to secure funding. It has also sped up the sales cycle, which is now a month instead of 18 months, he adds. And it is has helped XTEND become one of the largest drone manufacturers in Israel. “When the war started [in Gaza] with the sales cycles coming down and the need for drones and robots in the field, we were the largest drone company in Israel in terms of revenues and how many drones we were manufacturing. It became exponential.”



XTEND's precision strike and tactical drones significantly reduce training time for Israeli Defence Forces (Photo: XTEND)



Aviv Shapira, CEO, XTEND (Photo: XTEND)

XTEND

HUMAN | MACHINE TELEPRESENCE

“

When the war started, with the sales cycle coming down and the need for drones and robots in the field, we were the largest drone company in Israel in terms of revenues and how many drones we were manufacturing.

”

Initially, the drones XTEND supplied to Israeli Defence Forces were "specced" to army requirements. "They [soon] understood they needed different things," says Shapira. "A lot of drones work on GPS. But there was no GPS in the war. No one expected that to happen." So, indoor FPV racing drones migrated outdoors so the Israeli Army could fly them without GPS.

The war also made it easier for investors to justify putting aside financial and moral concerns that may have caused them to hesitate about investing in defence in the past. "For me, XTEND is saving lives and helping Israel in the war," says Kniajer. "[It is] a critical mission company defending the country. When you look at what's going on with the war in Ukraine, Israel, and everything around us, more people understand today it is the right thing to do to invest in defence."

Even in Europe, where the lack of investment in defence start-ups and SMEs has drawn criticism from European defence leaders who blame the economic bloc's and investors' strict focus on sustainability and environmental, social, and governance criteria, things are starting to shift, according to Kniajer, who believes that more capital will flow to European defence start-ups. "There is almost no other choice," he says. "It cannot just come from government initiatives. There should be a private sector that develops innovation and the best technologies out there."

XTEND is eyeing investment opportunities in Ukraine, where drone start-ups have proliferated following Russia's full-scale invasion of Ukraine. "We're now in the process of discreetly acquiring a company," says Shapira.

THE HEAT OF WAR

Lithuania is also drawing inspiration from the war in Ukraine to invest in new defence solutions. Edvinas Kerza, managing partner at ScaleWolf, a Lithuanian venture capital (VC) firm, says his country is small but "very ambitious". "Before the full-scale war came to Ukraine, we were thinking how to be better than Russia to create new and innovative solutions."

Kerza says it wanted to learn the lessons from Russia's occupation of Crimea in 2014 when many still imagined that a full-scale invasion of Ukraine was not possible. "We spoke with the government and asked them why they were not using VC [money] to foster modern, innovative next-generation technologies for defence. There were some R&D initiatives, [but] they were struggling."

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Granta Autonomy, which specialises in fully autonomous, lightweight, hand-launched UAVs for intelligence, surveillance and reconnaissance, was one of the first companies supported by ScaleWolf's dual-use tech VC fund & accelerator. Last July, the start-up secured €1 million in seed funding from ScaleWolf VC, Brolis Defence and HFL.

Kerza credits the growth of Lithuania's defence start-up community to the fact that the country feels the "heat of the war" in Ukraine. "[Western European] countries don't feel anything. They sit in warm chairs with the understanding that war will never come to their doors. The war in the east is not their war," says Kerza, a former vice minister of defence in Lithuania, who insists that his country has no choice but to find new and modern ways to protect itself against Russia, the "aggressor" on its border.

In response to the war in Ukraine, Kerza says Lithuania's military moved quickly to integrate various drone systems to save troops' lives and protect critical infrastructure. A new legal system was adopted to minimise bureaucratic procedures and better support companies that create drones by facilitating R&D and direct orders. "If you have long procedures for procuring technology it will be too old to send to the frontline. Ukrainians are urging us all the time that speed is one of the most important things," Kerza explains.

In September 2024, Granta Autonomy announced a new €1 million contract with the Lithuanian Ministry of National Defence for its first-person view (FPV) GA-10FPV-AI quadcopter drone. The new unmanned aerial vehicles will be supplied to both the Lithuanian military and Ukrainian armed forces and form part of a larger €8 million defence procurement initiative involving several additional Lithuanian drone manufacturers. More than 2,300 drones will be delivered to Lithuania, while nearly 5,000 will be sent to Ukraine.

“
If you have a good product,
Ukrainians welcome you.
They will test it, see if it
works and help you get [it]
to the frontline.”

”

The GA-10FPV-AI is a VTOL quadcopter that can carry a payload of up to 3 kg. Pre-programmed missions ensure autonomous operation, even in radio silence or GNSS-denied environments. The drone includes a ground control station with FPV goggles.

COMBAT PROVEN

The company's founders, Lithuanian military engineers Gediminas Guoba and Laurynas Litvinas, were inspired to start the company when Russia invaded



Gediminas Guoba of Granta Autonomy



Mike Dewhirst, Evolve Dynamics, holding the SKY MANTIS

Crimea in 2014. “Drones are an obvious force multiplier,” says Guoba who applauded Lithuania’s Defence Ministry for speeding up the contracting process for FPV drones. Granta Autonomy sent its reconnaissance drones for operators to use in Ukraine. While the demand for drones in Ukraine is great, ultimately, Guoba says it is about which technologies perform the best on the frontline. “Drones sit in warehouses because they are unusable and can’t be used in most jammed environments,” he says. “If you have a good product, Ukrainians welcome you. They will test it, see if it works and help you get [it] to the frontline.”

If you are a defence company, and your technology is not being used in Ukraine or Israel, what does that say about your future?, asks Shapira of XTEND. “There are two big wars right now in the world, and the next wars are coming: Korea, China, Taiwan, India, Pakistan, the world is boiling up.”

Companies like XTEND, which has first-hand experience working with Israeli Defence Forces on combat operations in Gaza, will have a distinct competitive advantage over newcomers hoping to crack the Israeli drone market, says Kniajer. “XTEND’s experience with the army puts them in an even stronger position in the future in terms of capital coming in and winning bigger [defence] projects.”

Another company benefiting from its exposure to the frontlines in Ukraine is the UK’s Evolve Dynamics, which has 20 employees in Ukraine, where it recently incorporated its operations. Following Russia’s incursion into Crimea in 2014, founder Mike Dewhirst utilised his knowledge of tech (Big Data, artificial intelligence) to start Evolve Dynamics in 2016, a business dedicated to providing small Unmanned Aerial Systems (sUAS) support to the Ukrainian military with its flagship platform, SKY MANTIS.

Last year, it launched its new SKY MANTIS 2 sUAS, with technology developed and tested on the frontline in Ukraine. Before Russia’s full-scale invasion,

Evolve Dynamics didn't focus massively on electronic warfare or radio jamming. "When the all-out invasion kicked off, we realised that was the main priority we needed to focus on," says Dewhirst. The company has since made hundreds of changes to its SKY MANTIS platform, the biggest being the radio it uses, which wasn't resilient to electronic warfare.

RAPID BLEEDING EDGE R&D

"The manufacturer has since released another radio, a lot better equipped for electronic warfare. But about a year ago, we approached a company called Doodle Labs, a US-based radio manufacturer. We worked with them very closely developing a radio that still worked under electronic warfare," says Dewhirst. "We fed back test results that we conducted in Ukraine

and gave them some suggestions for algorithm changes for their radio."

He says companies supplying drones in Ukraine are looking for higher levels of autonomy, terminal guidance and radios that are more capable than standard ones available on the market. However, procurement processes in the West are not keeping pace with the need to deliver the latest cutting-edge technologies to warfighters in Ukraine.

"We are in wartime, but a lot of procurement being done is peacetime procurement — systems that will spend decades on the shelf and need to be extremely reliable and tested to various degrees. Wartime procurement needs to be more rapid bleeding edge R&D. Russia is clearly on a wartime footing, but the West needs to catch up," says Dewhirst.

Building on the work it is doing with Israeli Defence Forces and the US Department of Defense's Irregular Warfare Technical Support Directorate, which recently awarded it a \$8.8 million contract to deliver precision-strike indoor and outdoor sUAS, the next phase for XTEND is what Shapira calls the "economy of war".

"Drones can replace standard munitions and missiles. They can do many things," he says, holding up what looks like a miniature rocket, that can fly 300 km an hour and is used to intercept other drones. "The price point for such a drone is roughly, \$10,000 today. It is one-tenth the price of an Iron Dome missile. But that is not enough," says Shapira. "We are trying to reduce that to \$1,000. It's always a game of numbers. How can we become cheaper and cheaper, but still not lose the edge of the software." ■



Granta Autonomy's Hornet-XR hand-launched UAS can perform autonomous missions even in "radio silence" (Photo: Granta Autonomy)



HOW AUTONOMOUS DEFENCE TECHNOLOGY IS SHAPING M&A

AI and unmanned systems are driving a wave of consolidation in the tech space as defence OEMs snap up smaller, innovative start-ups to stay relevant.

By Tom Rowe-Jones

The defence industry has always been at the forefront of innovation, with technological advancements playing a crucial role in shaping its future.

Today, the rise of autonomous systems and artificial intelligence (AI) is transforming defence, sparking a wave of mergers and acquisitions to secure competitive capabilities in a rapidly evolving market.

A key motivator for these firms is that a UAV may only be relevant for mere months before mitigations against it emerge, so developers need to spirally develop, test, upgrade

and produce in a much shorter time frame than they've done historically. This industry evolution is a huge value driver in the M&A space and the cause of much of the activity we're seeing today.

The autonomous revolution

Once seen as tools primarily for reconnaissance, UAVs can perform a range of missions, from surveillance to precision strikes, and counter-UAV technology is rising in parallel to meet the challenge. Simultaneously, AI enables predictive maintenance, mission planning, and real-time decision-

making, enabling smarter and faster military operations.

For defence firms, staying ahead of the curve is paramount. Autonomous systems and AI aren't just buzzwords; they represent a shift in how conflicts are approached and resolved, and this transformation is driving defence giants to seek smart acquisitions that boost their capabilities.

The role of M&A

M&A has long been a strategy for growth and diversification in the defence sector, but the focus has shifted from consolidating traditional capabilities to acquiring cutting-edge technologies. Defence firms are increasingly targeting innovative and specialist companies that excel in autonomous systems and AI, mainly because it's almost always quicker and easier than pivoting to a large, established company to develop those same capabilities in-house.

In early 2024, BAE Systems acquired Malloy Aeronautics, a British company specialising in heavy-lift unmanned aerial vehicles (UAVs), enhancing its military logistics and operational support capabilities. Similarly, in November 2024, Lockheed Martin Ventures invested in Vatn Systems, a start-up specialising in autonomous underwater vehicles. These types of moves make it clear that the big players in the industry are seeking niche expertise to complement their broader portfolios.

Why autonomous UAVs are a gamechanger

Autonomous UAVs have become a central focus in defence thanks to their versatility and operational advantages. Unlike manned aircraft, UAVs can operate in high-risk environments without endangering operators' lives and can perform missions with greater precision and efficiency, reducing both costs and collateral damage.

From a business perspective, the UAV market is booming. According to recent estimates, the global military UAV market is expected to reach £37 billion by 2032, with autonomous capabilities driving much of this growth.

M&A has long been a strategy for growth and diversification in the defence sector, but the focus has shifted from consolidating traditional capabilities to acquiring cutting-edge technologies.

Of course, with the rise of UAVs comes the need to mitigate them. The counter-UAV market is projected to

grow from around £1.4 billion in 2023 to £11 billion in 2032. This is only driving further consolidation as big players recognise the value in the ability to offer both UAV and counter-UAV solutions to their customers.

AeroVironment recently announced plans to acquire BlueHalo, a defence engineering firm specialising in counter-UAS systems, demonstrating the significance of UAS and counter-UAS capabilities in the modern environment. For defence firms, acquiring companies with expertise in UAV technology isn't just about staying relevant; it's about securing a share of this lucrative market without building capability from scratch.

The AI factor

While UAVs are revolutionising the physical battlefield, AI is transforming the digital realm. AI-powered algorithms can analyse vast amounts of data in real time, identifying threats, optimising resource allocation, and even predicting enemy movements. These capabilities are essential in an era where decision-making speed and accuracy can mean the difference between success and failure.

For defence firms, AI isn't just a nice to have, it's a core capability that enhances every aspect of their operations. From autonomous navigation to intelligent targeting systems, the applications of AI in defence are virtually limitless. To capitalise on this trend, major players

are acquiring AI-focused firms at speed. In April, US defence technology firm Shield AI acquired Sentient Vision Systems, an Australian company specialising in AI-powered sensor technology for UAVs. Lockheed Martin recently partnered with Meta to integrate Meta's Llama large language model into their AI Factory, developing tools for national security applications including code generation and data analysis, and emphasising the growing need for firms to integrate AI into their systems to stay competitive in a technology-driven battlefield.

What this means for M&A

The rise of autonomous systems and AI is not just reshaping military strategies, it's redefining the defence

industry's approach to growth. M&A activity in the sector is expected to continue ramping up, with defence firms prioritising acquisitions that enhance their technological capabilities, and this trend has several implications for the industry.

Firstly, we can expect increased competition to acquire smaller or more niche innovators like start-ups and scale-ups specialising in these technologies, who are becoming hot commodities. Defence giants are likely to face stiff competition from one another and non-traditional players like tech companies entering the defence space.

As firms acquire cutting-edge technologies, innovation will increase, with bigger budgets and strategic initiatives driving more and faster innovation than we've seen before.

While integrating autonomous systems and AI is an enormous opportunity, it also comes with challenges. Regulatory scrutiny, intellectual property concerns, and the need to integrate new technologies seamlessly into legacy tech stacks are just some of the hurdles defence firms will have to navigate. However, the benefits far outweigh the risks for firms willing to adapt. By embracing technological advancements through strategic acquisitions, defence companies can position themselves as leaders in an industry undergoing a dramatic transformation.

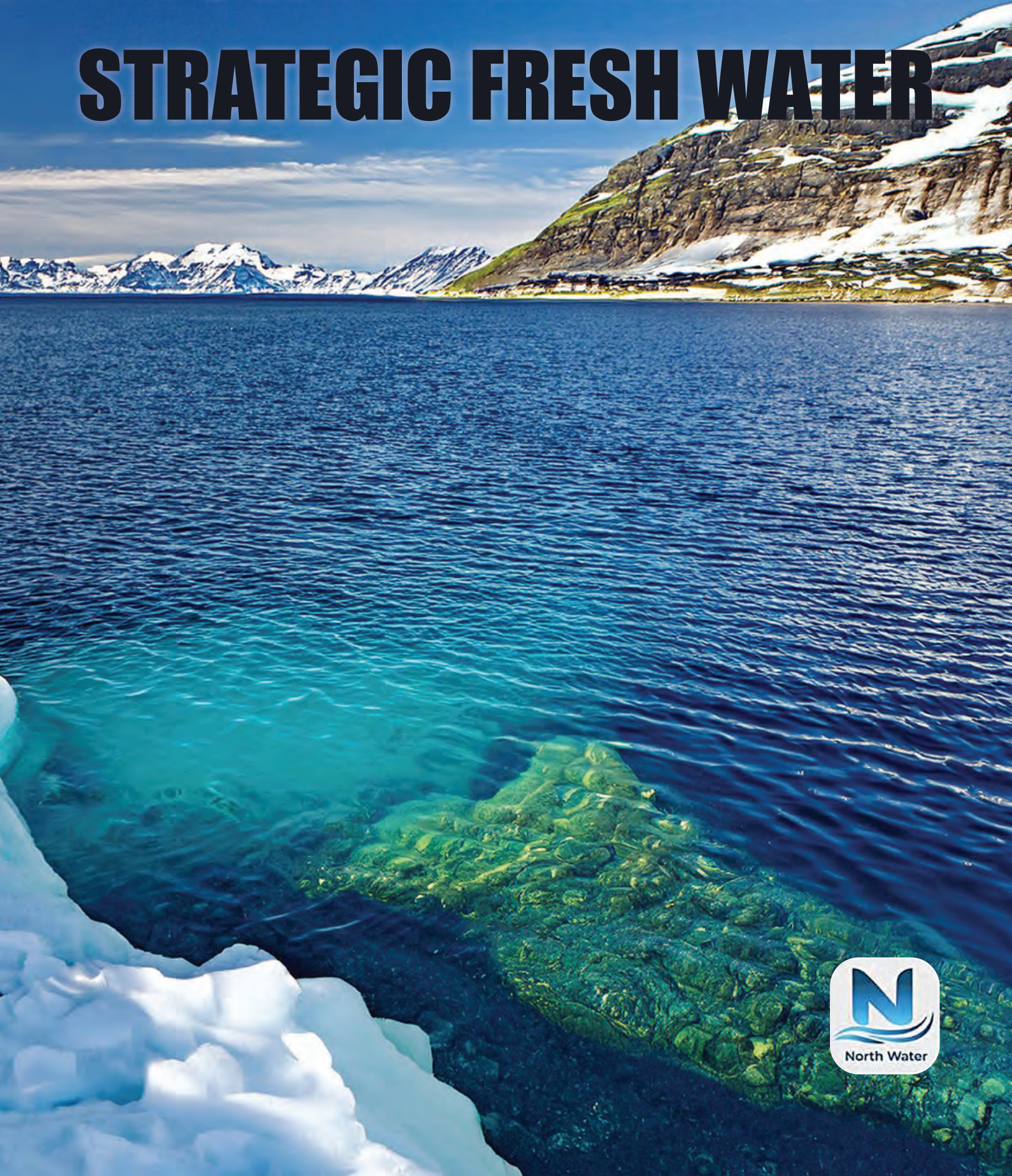
Tom Rowe-Jones, is M&A director at LAVA Advisory Partners.



Malloy Aeronautics, which specialises in heavy lift drones, was acquired by BAE Systems (Photo: MoD/Crown Copyright)

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BOOSTING SUPPLY CHAIN RESILIENCE WITH ADDITIVE MANUFACTURING: EXPLORING SOLUTIONS TO PRODUCTION AND LOGISTICS CHALLENGES

Why production stability and strong supply chain management matter.

Efficient supply chain management is essential to maintain a robust defence force. Major General Simon Hutchings underscored this importance in the UK's Defence Supply Chain Strategy, emphasising the role of the Defence Supply Chain (DSC) in national security. Effective supply chains directly influence the operational readiness of key assets – armoured vehicles, tanks, aircraft, and naval vessels, to name a few. These assets contain thousands of components, where a single unexpected failure can

render these assets inoperative. Replacing components relies on a rapid supply chain capable of delivering parts globally and demands access to spare parts and active suppliers for components that may not have been produced for decades.

The Ministry of Defence's 2023 Defence Inventory Management Report revealed the MoD holds over 740 million items valued at £11.8 billion, illustrating the scale of maintaining operational assets and the challenge of meeting urgent needs in a complex supply chain.



A selection of complex metal parts printed at MTC

THE ROLE OF ADDITIVE MANUFACTURING IN DEFENCE

Additive Manufacturing (AM) is playing a growing role in the sector and will be integral in strengthening defence supply chains now and in the future. AM contributes in three significant ways:

Direct part replacement in the field

AM enables on-site production of critical parts, minimising lead times and keeping equipment operational. This capability provides a “limp-home” solution, where forces can replace parts quickly in the field to stay operational, reducing risks while waiting for conventionally sourced parts, or the AM component remains. This is demonstrated by the seven WarpSPEE3D machines deployed to Ukraine by the US Department of Defense to allow rapid manufacture of critical parts for armoured platforms and aging military equipment systems.

Replacing long lead time or obsolete parts

AM addresses challenges with obsolete parts by bypassing traditional supply chains. Group Captain Leonie Boyd from the Royal Air Force highlighted at DSEI in 2023 that defence inventories are often compromised due to part obsolescence, long lead times or closed production lines. AM can produce parts more rapidly and cost-effectively than reopening costly production lines, ensuring continuous operational support.

AM-specific part design

Designing parts specifically for AM allows for innovative configurations that benefit from the technology’s unique strengths. One notable example is Advanced Innovative Engineering (AIE), a supplier of lightweight power solutions for unmanned aircraft and high-performance vehicles. AIE collaborated with The Manufacturing Technology Centre’s (MTC) AM engineers to reduce a rotary engine’s weight from 6kg to 4kg, cut the component count, and lower manufacturing costs without compromising operational performance. Such collaborations showcase how AM-specific designs simplify supply chains, reduce part counts and enhance product efficiency.

Despite its many benefits, AM does face commercial and technical challenges. While AM’s advantages are clear to those who have experience with it, those outside often view it as costly or risky. Issues such as process stability, material

quality, and part qualification remain ongoing hurdles, but industry advancements are expanding the use of AM parts, which will continue to grow into the future.

HOW MTC IS ADDRESSING THESE CHALLENGES

As the UK’s National Centre for Additive Manufacturing (NCAM), MTC is at the forefront of AM advancement and offers support to defence and other critical sectors tackling AM challenges. Located in the heart of the UK, MTC’s cutting-edge facility combines state-of-the-art AM machinery within a secure environment, enabling the safe handling of sensitive projects, producing complex parts in advanced materials that others simply cannot.

MTC’s team of leading AM experts brings extensive experience across sectors, with a proven track record of collaborative projects with industry partners and MTC members, often in introducing AM parts and building the associated supply chains necessary to support. MTC’s specialised knowledge in part qualification, particularly in the rigorous aerospace sector, ensures that AM components meet the highest standards and certification requirements.

By guiding organisations from AM-specific design through to part qualification and supply chain integration, MTC empowers customers to increase supply chain resilience, reduce lead times, and drive cost savings – critical advancements for maintaining operational readiness. ■

Find out more about the solutions MTC provide here – <https://www.the-mtc.org/am-defence>



An MTC engineer at the NCAM facility

TASK FORCE 59 RESHAPES GULF NAVAL OPERATIONS

The Commander of the US 5th Fleet's Task Force 59 explains how manned-unmanned teaming shortens decision cycles and bolsters maritime security across the Middle East.

By Lee Willett

Western navies have long maintained a substantial naval presence in the Gulf region, a major global trade route. But as geopolitical tensions mount, navies have had to rethink operational fundamentals in the long-established maritime “hot spot”.

Alongside more traditional tensions in the Gulf between Iran and Western navies, across the Arabian Peninsula, the Houthi campaign targeting commercial and naval shipping that began in late October 2023 means that two regional maritime choke points are being threatened by rogue actors. These choke points are the Straits of Hormuz and the

Gulf of Aden, Bab-al-Mandeb, and the Red Sea. The evolving threats to these choke points are just the latest disruption to regional maritime security. They are also causing Western navies to explore new ways of bolstering surveillance using maritime uncrewed systems (MUS) deployed alongside crewed platforms.

Generated under the Gulf-based US 5th Fleet's Task Force 59, which was established in September 2021 and intended to integrate MUS and artificial intelligence into naval operations to support maritime security requirements – MUS capabilities are developed through test and evaluation and operational

experimentation at sea, before being deployed to deliver operational effect.

They are enhancing US Navy and regional partner surveillance coverage in the region, adding mass in terms of the number of sensor platforms deployed and the data they deliver. Given the region's growing regional maritime instability, the output from these sensors is vital for operations today.

While maritime situational awareness has always been important, it is more recognised now due to the urgent and ever-increasing requirement to inform the Commander's need for real-time decision-making, Captain John Barrientos,

A Task Force 59 unmanned surface vessel
(Photo: US Army)

Commodore of TF-59, told Defence Procurement International.

“TF-59 continues to advance US 5th Fleet’s intelligence, surveillance, and reconnaissance (ISR) and information-sharing abilities by integrating unmanned systems and leveraging artificial intelligence, bringing meaningful contributions to the joint force picture in the US Central Command area of responsibility,” he says.

Since TF-59 was established, the face of warfare has changed, and so has TF-59, Barrientos explains. Initially, TF-59 focused on using MUS capabilities to enhance capacity for monitoring key strategic waterways. Now, operational commanders need MUS to provide enhanced capacity to inform and shorten decision-making cycles.

“We want to maintain a speed of relevance while ensuring that the technology we bring out helps the Commander shape effects for a desired outcome,” says Barrientos. “Our value proposition is rapid operational experimentation at the tactical edge, leveraging commercial technologies in a complex environment, with direct input from the operators. This allows technologies to prove their capabilities by learning quick [and] failing fast and continuing to provide as much value as possible.”

Effectively, TF-59 has evolved to focus on operationalising the key technologies it proves through test and evaluation to become a force provider for the operator. “The present [operational] circumstances make TF-59’s rapid innovation approach even more crucial and help prove the importance of TF-59 and similar organisations,” says Barrientos.

A ‘HYBRID’ APPROACH TO SITUATIONAL AWARENESS

As the USN and regional partners’ maritime situational awareness and ISR requirements shift when facing evolving threats, TF-59 plays a key role in harnessing the contribution MUS can make, particularly in tandem with crewed systems.

“MUS play a vital role in improving the efficiency and effectiveness of naval assets, expanding naval capability in the [maritime situational awareness] mission,” says Barrientos. “Going forward, naval warfare will always take a hybrid approach — manned/unmanned teaming [M/UMT] leveraging air, surface, and sub-surface MUS to protect manned assets.”

Here, he adds, technologies like artificial intelligence and machine learning can assist in leveraging various MUS outputs, from understanding anomalies in maritime patterns of life to augmenting lethality and precision, helping enhance the effectiveness of the M/UMT fleet.

“Through our model, we fully embrace M/UMT as a force provider for the Fleet Commander and supporting entities, including partner countries,” says Barrientos.

Since its inception, TF-59 has evolved through experimentation in bilateral and multilateral exercises with regional partners and other task forces to operationalise proven technologies more rapidly. “Our mission is to identify the end user’s problem sets, find a solution, quickly burn it in, and continue to iterate the technology to provide operational impact. This is what we call our capability sprint model,” Barrientos explains. “This is all focused on commercial technology, from concept to contested operations at scale and speed.”

Over the last 12 months, TF-59 has conducted five MUS-focused bilateral exercises with five different regional partners. The operational focus of each event has ranged from medical evacuation to harbour security, to high-value unit escort. In these contexts, Barrientos says all regional partners see the value in MUS and the capability multiplier they provide, including waterway management and maritime domain awareness on, above and below the surface.

Even with TF-59’s increased emphasis on rapid capability delivery to enhance

operational output, exercising remains crucial in validating the process of operationalising capability, says Barrientos.

“Our partners have similar needs [to ours]: more sensors to protect strategic waterways. The most economical approach to this is dual-use technology providing sensors on the water.”

The importance of bringing through commercial technology is to provide a more rapid operational impact. One current focus area is augmenting MUS

payloads, assessing technologies like GPS-denied payloads, kinetic payloads, and edge computing.

In mid-2024, TF-59 hosted the USN’s Naval Information Warfare Systems Command, Pacific and the Defense Innovation Unit for a testing and evaluation event involving the Common Operational Database, which focuses on increasing MUS effectiveness by leveraging “edge to compute” technologies to operate effectively in disconnected, denied, intermittent, or limited bandwidth environments. “This event proved COD’s value for future operations, especially in enhancing M/UMT collaboration with our coalition partners,” says Barrientos.



An unmanned surface vessel, attached to US Naval Forces Central Command's Task Force 59, participates in exercise Digital Talon 3.0 (US Army photo)

PROBLEM-SOLVING AT THE TACTICAL LEVEL

For some time, naval operators have focused on a “system-of-systems” approach to building capability at sea. With the advent of MUS, that focus has become even more essential in today’s more complex operating environment, explains Barrientos. For TF-59, its geostrategic location means it is innovating right at the tactical edge. “What we learn and validate

here can have tremendous implications in other fleets,” he explains. “Our battle lab environment can quickly prove or disprove capabilities. This is not just specific to MUS, but also the communications infrastructure, data-streams integration, and interoperability with crewed assets.”

The recent escalation in maritime security threats has only underlined TF-59’s relevance. “I see our value proposition remaining constant:

technology integration problem-solving at the tactical level,” says Barrientos.

This operational emphasis was underlined in January 2024, when an operational task group was set up under TF-59.

According to a US Navy statement, TF-59 “focuses on the operational deployment of unmanned systems teamed with manned operators to bolster maritime security across the Middle East region”. ■



OPINION

NAVIGATING THE RF DATA TSUNAMI

Modern military operations are deluged with RF data from multiple devices, sensors and unmanned systems. Addressing this challenge is not just a matter of technological advancement; it's a critical national security imperative.

By Scott Aken

In the evolving landscape of modern warfare and intelligence gathering, a silent but critical challenge looms large: The overwhelming flood of radio frequency (RF) data. This deluge of information, generated by an ever-expanding array of wireless devices, sensors, drones, electromagnetic warfare, and advanced signal collection systems, pushes signal intelligence capabilities to their limits.

The RF spectrum is increasingly crowded, making it difficult to isolate and identify individual signals of interest. Overlapping signals create interference, while the high volume introduces significant noise, obscuring critical signals.

This phenomenon has created a modern “needle in a haystack” problem for agencies tasked with identifying critical information amidst the noise. The impact on intelligence operations is significant, potentially causing crucial information to be missed and compromising mission success or national security.

The nature of modern RF transmissions adds another layer of complexity. Modern RF communication signals are often intermittent and constantly change the frequency they transmit on — also known as frequency hopping and spread spectrum technologies. This requires sophisticated processing to

extract meaningful information and makes human real-time analysis challenging. Intentional signal obfuscation techniques employed by adversaries such as data further exacerbate the complexity.

RF receiver limitations such as finite bandwidth and dynamic range force operators to focus their analysis in a select part of the spectrum, resulting in missed signals in other parts. The sheer volume of data often exceeds the capacity of current processing systems, especially under real-time operating requirements. High-intensity signals may mask weaker signals of interest or produce inaccurate threat assessments, compromising operational effectiveness.

Processing this massive amount of data presents unique challenges, particularly in field operations where size, weight, and power constraints are critical factors, and adding more processing power through additional hardware is not an option. Traditional data analysis systems often struggle to keep pace with the volume and velocity of today's incoming RF data, which is challenging for systems and operators alike.

Enhancing defensive and offensive strategies

New approaches in RF analysis for electromagnetic warfare are being developed to address these challenges.

Advanced signal processing techniques use machine learning and AI for enhanced signal detection, classification, and interpretation by identifying patterns and anomalies tra-

ditional methods might miss. Furthermore, adaptive filtering allows systems to dynamically adjust to changing signal environments to improve signal separation and noise reduction. These capabilities sometimes require a significant upgrade of decades-old analysis systems, which demands budget increases and accelerated acquisition cycles.



The sheer volume of data often exceeds the capacity of current processing systems, especially under real-time operating requirements.



Cyber and electronic warfare convergence provides integrated operations to enhance offensive and defensive strategies. This requires a technical integration between cyber and electronic warfare technology, which is difficult as vendors often address only one or the other, but rarely both.

A bigger challenge is the policy and organisational hurdles involved with integrating cyber and electronic warfare teams. Historically, these teams have been separate. The US Department of Defense has combined these teams in



7th Cavalry Regiment and 1st Battalion, 4th Infantry Regiment conduct electronic warfare training (US Army photo by Sgt. Julian Padua)

the form of the Army's Cyberspace and Electromagnetic Activities and Multi-Domain Task Force. However, this is a complex leadership, coordination and training challenge which requires additional effort and funding.

Another trend, especially for forward-deployed tactical systems, is the importance of miniaturisation and mobility solutions. Portable tactical systems require advanced miniaturisation of RF analysis equipment for deployment in mobile scenarios, small satellite and unmanned aerial vehicle-based sensors use compact platforms to provide flexible and wide-spread RF sensing coverage.

As we have seen in recent conflicts, commercially available solutions such as drones can accelerate development but of-

ten do not meet the advanced standards the military requires. Software-defined radio systems and edge computing solutions are being deployed to enhance adaptability and reduce data transmission needs.

Lastly, there's a need for a shift in how data collection and analysis are approached. With electronic warfare using land, sea, air, and space data collection, processing all this data requires smarter, more selective collection strategies that cut across many services and organisations in the US military.

In addition to using adaptive techniques to optimise data collection in real-time, ensuring that critical information is not lost in the deluge of RF data, policy and organisational integration strategies are

crucial. The US DoD has published Joint Electromagnetic Spectrum Operations guidance that discusses the principles for planning, executing, and assessing joint electromagnetic spectrum operations across the competition continuum. It does not restrict the authority of the Joint Forces Commander but instead offers a framework on how the different DoD services conduct operations within the electromagnetic spectrum.

A powerful asset

The challenges posed by the RF data tsunami will only intensify. The proliferation of wireless devices and the increasing sophistication of adversary communications systems will further complicate the RF landscape. Addressing

this challenge is not just a matter of technological advancement; it's a critical national security imperative.

The ability to effectively process and analyse RF data plays a crucial role in maintaining strategic advantage, protecting forces, and safeguarding national interests in an increasingly complex and contested electromagnetic spectrum.

By leveraging the advanced techniques and technologies discussed, such as AI-driven signal processing, cyber-electronic warfare integration, and mobile sensing platforms, military and intelligence communities can transform this data challenge into a powerful asset for national defence and intelligence capabilities.

Companies at the forefront of high-speed data processing and analytics are crucial for this critical challenge. Many are well-positioned to play a pivotal role in this evolving landscape, providing the technological backbone needed to turn the RF data challenge into a strategic advantage. But often they lack access to military contracts. In addition to technological innovation, the policies and organisational structure must be in place to address this urgent issue facing our national security.

Scott Aken is chief executive of Axellio. He has over 20 years of experience in cybersecurity and RF technologies, including leadership roles at CACI International, L-3 Communications, and as a Special Agent with the FBI's Cyber Action Team.

BOOSTING VISIBILITY AND INTEGRITY OF DEFENCE SUPPLY CHAINS

The technology is at the ready to take defence supply chains to the next level — defence manufacturers now need to utilise it.

IFS

The defence supply chain has never fully restabilised since being upended by the [Covid-19 pandemic](#). Recent issues from soaring material costs, natural disasters, geopolitical warfare and conflict have all added to its problems.

Rob Mather, Vice President of Aerospace & Defence at [IFS](#) believes the required tools and technologies are available. Defence organisations just need to take advantage of them to improve and build a resilient supply chain — from nearshoring to AI to blockchain-enabled distributed ledgers, the tech is ready to enable organisations to take back control of their supply chains, their suppliers and their production.

Geopolitical conflicts have only served to exacerbate, elongate, and highlight defence supply chain issues. Despite recognition from the [US Department of Defense](#) to improve their defence industrial bases to increase asset production rates and the [UK military](#) investing £7.8 billion in military assistance, resources and assets readily available for military forces are stretched.

SUPPLY CHAINS DIVERSIFY AND MOVE CLOSER TO HOME

Defence supply chains can typically include thousands of individual vendors based across the world. The US defence industrial base is made up of over [100,000 domestic and foreign](#)

subcontractors. Shipping rates alone for routes from [Shanghai to Los Angeles](#) have increased by nearly five times in 2024 compared to pre-pandemic levels.

In times of increased geopolitical tension amid rising prices, defence organisations must diversify their supplier base to increase resilience. By expanding their supplier base and utilising real-time data monitoring tools, defence organisations now have the tools to ensure they select the right supplier to reduce wait times.

In recent years, more than [70% of large enterprises globally](#) have increased their usage of domestic suppliers compared to international suppliers. In this nearshoring move, exceptional supply chain management is key, and technology needs to deliver the agility and fast Time to Insight (TTI) to help forecast demand and provide detail across supply chains.

DIGITAL TOOLS ARE READY TO PROVIDE MUCH-NEEDED TIME TO INSIGHT TO FORECAST AND PROVISION

In its 2025 Aerospace & Defence Industry Outlook, [Deloitte](#) expects “to see industry leaders evolve their digital applications for supply chain visibility to resolve issues ranging from parts and labour shortages to concerns with the quality and reliability of parts.”





Based on distributed databases shared between peers, blockchain stores data and amendments in chronological, secure, and immutable format. The potential for these blockchain technologies to boost supply chain visibility is highlighted in a recent [EY report](#): “Blockchain technology is solving the complexities of

For defence supply chains to improve, a lot of the responsibility falls on the shoulders of manufacturers and suppliers to increase their flexibility and production. In the past, to deal with rising pressures, defence manufacturers looked to switch up their inventory strategy from lean to just-in-time (JIT) practices. However, with growing supply chain issues across the globe, production and financial risks have increased.

More sophisticated digital approaches such as demand-driven material requirements planning (DDMRP) are needed to help reduce the risks for defence manufacturers. Through usage data, DDMRP determines if stock levels can cover demand, thereby increasing flexibility for manufacturers and reducing downtime, as stock levels will always be adequate to match demand.

SPOT THE BOTTLENECKS BEFORE THEY BECOME COSTLY WITH INDUSTRIAL AI

AI tools can help manufacturers and suppliers optimise the defence supply chain by reducing production and financial risks. Investment is increasing from defence forces – the US Department of Defense already allocated [\\$1.8 billion of their 2024 budget to AI](#).

Combining AI pattern recognition with real-time data can help DDMRP improve the accuracy and speed of anomaly detection throughout the organisation which helps manufacturers and suppliers to identify potential bottlenecks in their processes before they cause costly holdups, giving time for a viable solution or workaround to be found.

BLOCKCHAIN OFFERS A NEW WAY TO BOOST CRYPTOGRAPHIC INTEGRITY

Looking further ahead, manufacturers can integrate new technologies such as blockchain which has been recognised in the [US Senate Armed Services Committee FY 2025 NDAA](#) to “enhance the cryptographic integrity of defence supply chains, improve data integrity, and reduce risks of data manipulation by adversaries.”

A&D supply chains by ensuring immutable traceability of parts, fortifying against counterfeiting and facilitating seamless data sharing across the ecosystem.”

COMBAT SUPPLY CHAIN DISRUPTIONS BY LOOKING THROUGH A SINGLE PANE OF GLASS, END-TO-END SUPPLY CHAIN MANAGEMENT SYSTEM

To get the real-time data they need, defence organisations need to move to a single, integrated system incorporating all aspects of the supply chain — to ensure the right data ends up with the right people. There are three key capabilities defence organisations need to look for when implementing an integrated supply chain system:

- **AI and predictive analytics** – by combining advanced anomaly detection and pattern recognition with real-time data correlations, defence supply chains will become more resilient to disruptions and accelerate problem detection.
- **Simulation modelling** – digital twins and cutting-edge simulation modelling technologies can identify defence organisation weaknesses and address the problems impacting operations.
- **Connecting supply with demand** – real-time monitoring technologies increase visibility allowing organisations to know when they need new parts and what suppliers can deliver on time.

THE NEW CHAPTER FOR THE DEFENCE SUPPLY CHAIN IS NOW

Global defence issues are not going away. Defence organisations must ensure their supply chains are at the ready to make sure that disruptions become a thing of the past. That means diversifying, reshoring and utilising industrial AI and digital tools to manage the inevitable growth in distributed ledgers. All integrated into a single supply chain management system to provide that essential single pane of glass visibility to ensure assets and resources are mission-ready. ■

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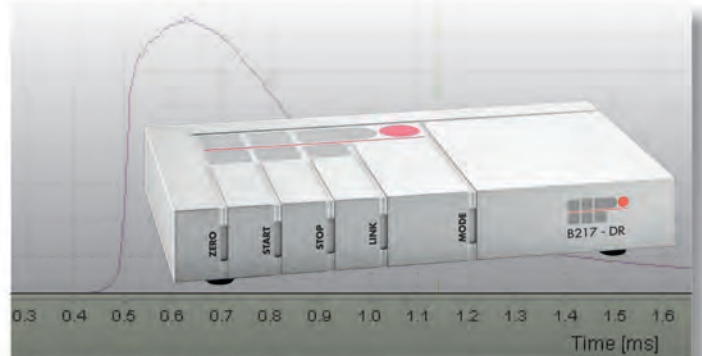
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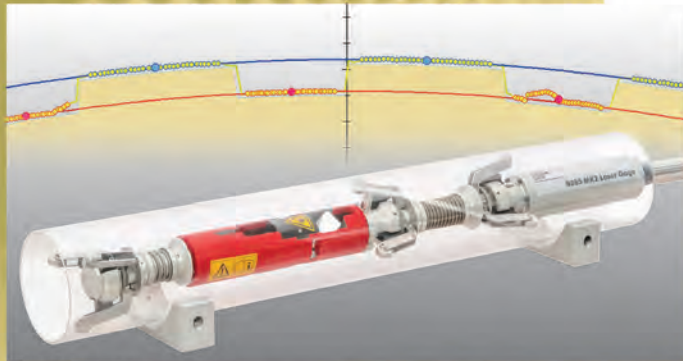
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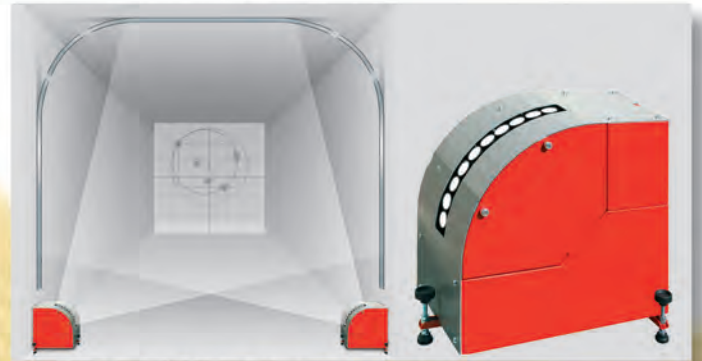
Piezoelectric High Pressure Transducers – GP Series



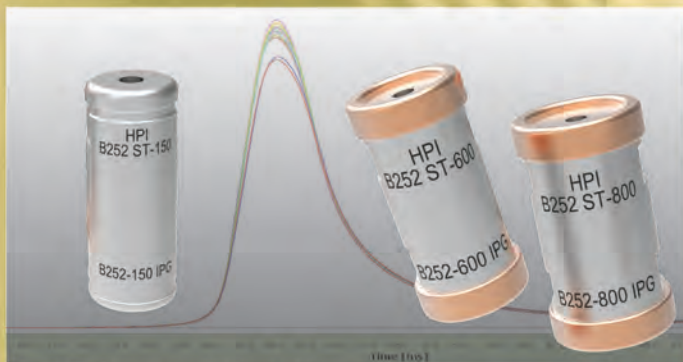
B217-DR Data Recorder



B285 MK2 Laser Gage



B590 Optical Target System



B252 IPG Internal Piezo Gauge



B573 Optical Target System



B481 Doppler Radar System



B472 Precision Light Screen, B462 Measuring Frame

THE MOST SOPHISTICATED TRACKING SECURITY FOR GLOBAL SUPPLY CHAINS

Zenatek

In military supply chains, tracking regulations and security fall under the control of military logistic departments and authorities.

One might assume that these authorities provide cargo monitoring at its best. Unfortunately, there is evidence to suggest that this assumption is not warranted. There are military deployments in which tens of thousands of containers or pallets per year remain unaccounted for, without a proper e-tracking system. Such waste or misplacement of costly resources is bad enough, especially if the resources represent depreciating or perishable assets. Much more importantly, the troops involved may suffer the consequences of improper tracking and may not be as well protected or as well fed as they should be.

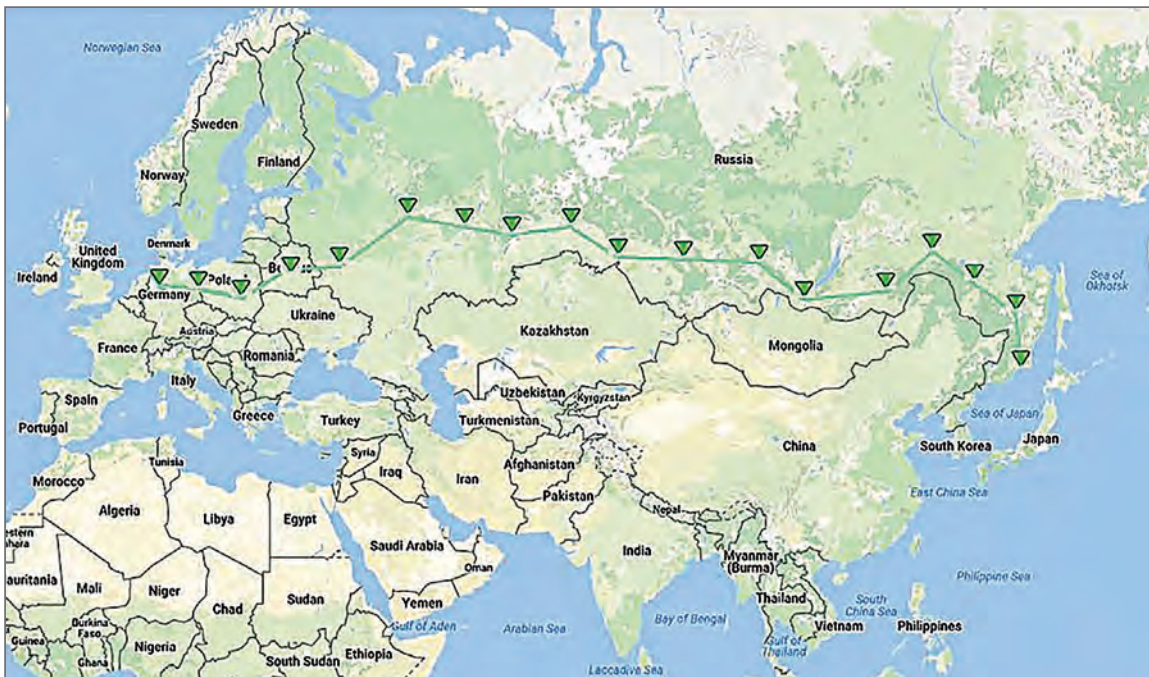
Improperly tracked or missing containers hold not only food items and supplies necessary to sustain troops and keep them healthy, but also equipment and material, including vehicles, air conditioners, earth-moving equipment, and more.

It is not unusual for key shipments to arrive late, or to miss transshipment. They may even be untraceable in ports and countries suffering critical logistics issues themselves. Moreover, some transporters have been known to hide their problems, keeping missing containers in certain port yards or other “off-the-grid” facilities. Such transporters are not always happy that clients may want to monitor and analyse the whole transport process to ensure their money has been well spent. There is also the problem of frequent overcharging of demurrage fees to clients.

POSITIONING ENHANCEMENT INTELLIGENCE FOR DEVICES USING ON EDGE NEURAL NETWORK

The new ZTD device uses standards (OPC UA) and devices (IoT Tracker) to the ASSIST-IoT architecture along with an innovative edge enabler that fuses IMU and GNSS data coupled with artificial neural networks, optionally chip-based, to improve monitoring of port equipment and containers.

The upcoming device release is based on next-generation satellite technologies (SatNav, SatCom, SatEO), used with the latest data intelligence and certification technologies (Edge AI, IoT and DLT) to offer Remote Container Monitoring (Monitoring-As-A-Service) services, increasing the security and reliability of the entire supply chain.



Tracking of goods equipment from Europe to Russia

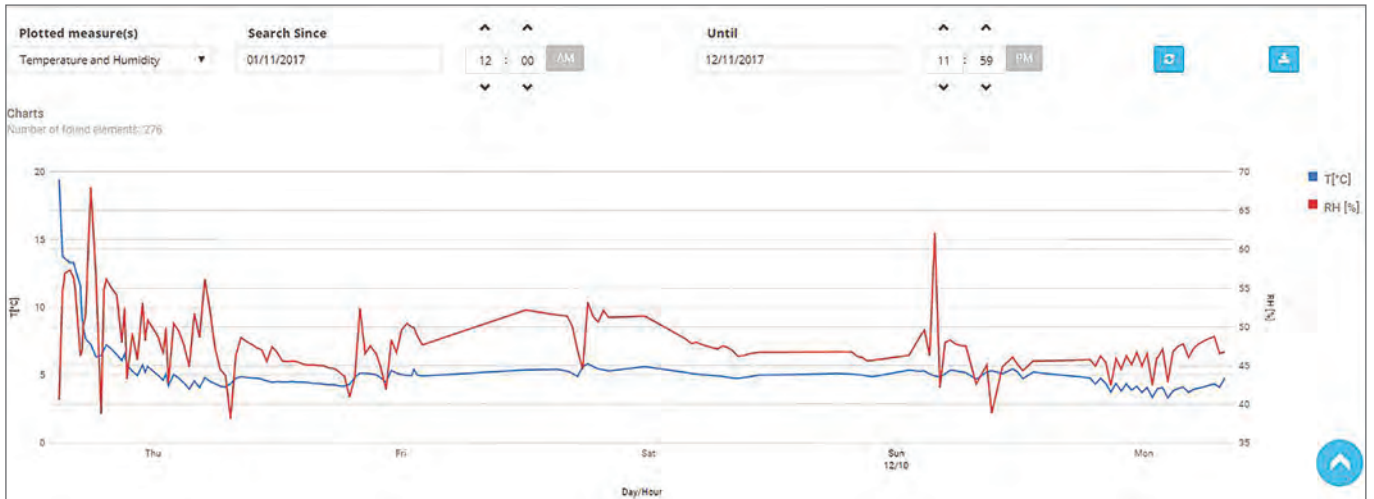


Chart of temperature and humidity related to a transport of ammunition

With modern, technologically advanced real-time monitoring provided by Zenatek Tracking Service (ZTS), these problems can be eliminated quickly and efficiently. Our service is very reasonable and cost-effective, and we have a proven track record of excellence in the field. Today, we track goods globally and have recently expanded our service, extending it to a much broader range of goods without sacrificing the discretion our clients' demand.

ZTS was designed to maintain strict cost control. Our primary aim was to develop a rock-solid goods tracking system that would remain affordable while meeting the needs of our service's end users. We have created a system that is intentionally simple and stable, based on user-friendly web-based software. For practical purposes, it is not necessary to verify the location or positioning of the goods every 30 minutes. Nor is it necessary to implement overstated monitoring requirements that increase battery costs and may lead to the hardware device being returned to the sender. However, it is critically important to have the capacity to determine and trace all shipments' routes, and to receive immediate alert notices when something unexpected or unpleasant happens to a shipment. These alerts are sent by Zenatek's web-based system via e-mail to any computer, smartphone or other device assigned by the client.

To provide an accurate geographical position for a monitored shipment at any point, the ZTS tracking device may use its internal GPS, which is compatible with the GPS/Glonass standard and is also Galileo-ready. Alternatively, it can leverage information from mobile network cellular towers. The user can remotely configure all of the system's communication parameters, even after a shipment has departed the loading point.

ZTS can also store a container's packing list, password-protected, in the web-based application, together with bill-of-lading documents and health certificates, thereby enabling the receiver to trace the shipment's contents and route with a mere finger-click on a tablet. The ZTS device will also trigger alarms when a reefer container's internal temperature and humidity deviates from a predetermined level set by the client.

It then alerts the user when the temperature and humidity return to the required level. Additionally, it will alert the user if flammable goods within a container are approaching the point of ignition, or if a container's doors or a pallet's seals are subjected to tampering. It will similarly alert the user if a container or pallet is turned on its side, capsized or involved in a destructive incident.

The ZTS device has a geo-fencing capability. This means that if a trailer or container is placed in a new location or moved to another part of the current port, the device will wake up and alert the user. The device also provides geo-coded proof-of-delivery information to the client, who can then rest secure in the knowledge that the shipment has reached its





destination, and that there has been no unauthorised opening of a container's doors or tampering with a pallet. The device conforms to international regulations, including FCC and EU standards, not to mention that it is also HERO-compliant.

Other currently available tracking technologies do not fare well in performance comparisons with ZTS, and some of those products can be very expensive. Some operate based on monthly fees, or payments per communication received by the client, or both. Zenatek, on the other hand, designed and manufactured ZTS with affordability in mind. ZTS devices need not be retrieved at destination points because all traced route and shipment information is in the system and has already been transmitted — the devices may be used on a “one-way” basis. This eliminates all costs associated with unit and data recovery tasks, such as recovery personnel costs, and unit forwarding, reconfiguring, and restocking. These aspects of ZTS in particular make it ideal for military logistics applications.

Pallets may be transported and tracked in containers; they may be transferred to train or truck, and then reloaded into containers based on any intermodal chain. ZTS will track accurately and provide status reports throughout, monitoring for any damage, tampering, interference, or deviations.

Real-time status updates and event alerts allow users to respond quickly to changes and emergencies. ZTS affords users the possibility of prompt, effective damage control, even to the extent of rerouting an entire shipment if necessary. The benefits are obvious, particularly concerning time-sensitive or temperature-sensitive shipments.

Users can also elect to provide receivers with access to ZTS web-based applications so that they are equally informed as to a shipment's status and current location. Clients can predetermine the range of the information to be made available; they may change access to and frequency of status updates for any or all of the available information. All data is contained within an encrypted data stream for full security, maximum confidentiality, and protection.

Today, one of the mostly frequently used tracking technologies is RFID (Radio Frequency Identification). Unfortunately, RFID technology depends on the acquisition of a costly infrastructure

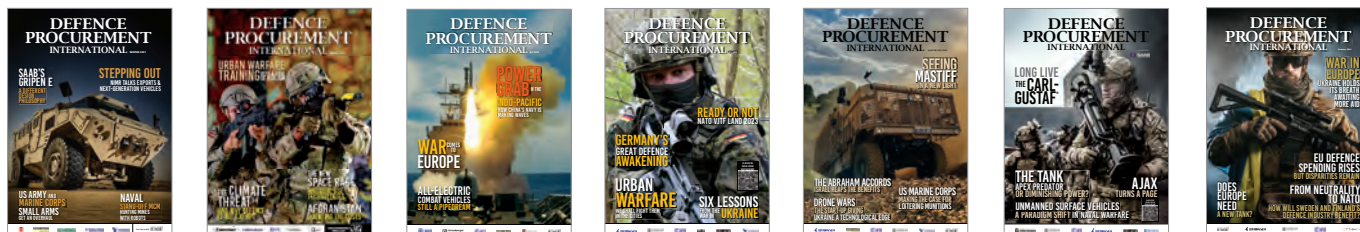
of porticos and hardware at fixed sites, or unreliable hand-held transceivers that need constant maintenance. An RFID device could, at least theoretically, be manipulated to form part of a weapon (for instance, as a triggering device) designed to attack a specific shipment.

ZTS leaves RFID technology and its associated problems and expenses behind. With ZTS, clients now have access to a one-price solution that includes all costs associated with the technologies and services provided.

We live in a world that seems increasingly insecure, and some would resort to violence in their attempts to disrupt international civil and military supply chains. The threat of terror attacks targeting global logistics through vulnerable transport systems can never be eliminated, but it can certainly be reduced. The continuing use of unchecked and unmonitored containers, pallets, trailers, and rail cars, when viewed in combination with current business practices in many congested ports, represents a hidden but very real danger. With Zenatek service these potential threats can be seriously reduced. ■



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