EUROPEAN DEFENCE AGENCY

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EDM

EUROPEAN DEFENCE MATTERS

Shelter from the swarm

How we are adapting to the drone age

› MINISTER OF DEFENCE, CYPRUS

Why Ukraine matters for the Eastern Mediterranean

› DRONES AFTER MIDNIGHT

Testing defence robotics from Estonia to Italy via Portugal

› MILITARY AWAKENING

The EU's Military Staff, 25 years after the first bugle call

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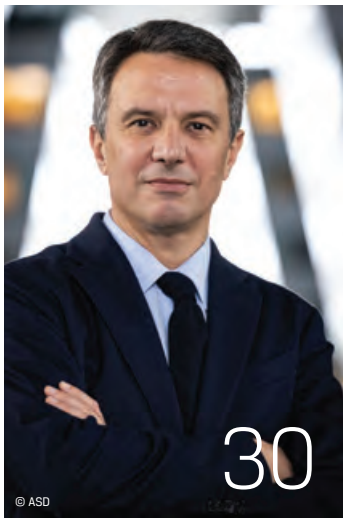

East of Eden

As Ukraine's war enters its fifth year, Europe faces another reckoning. Russia is exploiting its immense industrial base and population to exhaust its neighbour, while Ukraine depends on Western resolve to keep its army supplied and its citizens protected. The EU will loan €90 billion to Ukraine to keep it afloat financially over the next two years. Between 2026 and 2029, Kyiv will require more financial and military support. That will test the EU's staying power as never before.

Complicating matters, the Trump administration's new National Security Strategy brands Europe as weak, questions the foundations of the transatlantic alliance and echoes Russian narratives, signalling that Europe may increasingly need to rely on its own capabilities.

Recent incursions by Russian drones into EU and NATO airspace, including over Poland, Germany and Denmark, have dispelled any illusion that the threat is distant. Cheap, mass-produced drones are probing vulnerabilities in Europe's air defences, forcing a shift towards faster, smarter and more economical countermeasures.

Even so, Europe is not standing still. In this edition of *European Defence Matters*, we show how the European Defence Agency (EDA) is supporting Member States to adapt to the age of autonomous systems, moving more quickly from experimentation to field testing.

Joint procurement efforts for loitering munitions, backed by the first comprehensive business case for collaborative acquisition, are strengthening Europe's ability to equip its armed forces with speed and purpose. And across the domains, preparations for the next era of warfare are well under way.

From Tallinn, we explore how the EDA Action Plan on Autonomous Systems – and its wider Community of Interest – provides a framework to accelerate capability development while upholding reliability, efficiency and ethical standards.

Meanwhile, innovation is reshaping the defence landscape across Europe.

In these pages, Frankenburg Technologies details how affordable missile systems can counter drone attacks. Separately, trials in Portugal with unmanned maritime platforms show a new generation of naval concepts. As with automated air-to-air refuelling, Europe's armed forces are learning to match resilience with ingenuity.

With the focus rightly on Ukraine, Cyprus' Minister of Defence Vasilis Palmas reminds us that Europe must also keep a vigilant eye on the Eastern Mediterranean.

We mark 25 years of the EU Military Staff, reaching its milestone in 2026, and we hear from ASD's new Secretary General, Camille Grand, who calls for a four-pillared agenda: support to Ukraine, readiness, strategic enablers, and innovation – priorities woven throughout this magazine.

The road ahead remains demanding, and Russia's so-called peace proposals still hinge on territorial concessions that are difficult for Ukraine to accept. Negotiations appear to be going in circles. The lesson for Europe is stark: only unity, strategic foresight and an uncompromising defence posture will secure our continent, and citizens' safety.

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Kaja Kallas, the EU's High Representative for Foreign Affairs and Security Policy, Vice-President of the European Commission, is also Head of the European Defence Agency (EDA). She sets out her thinking for *European Defence Matters*.

Complementing NATO: Why the EU needs **credible forces** at the ready

The opening of the *White Paper for European Defence – Readiness 2030* published in 2025 comes with the stark warning: "Europe faces an acute and growing threat". Russia's unjustified war of aggression against Ukraine has shattered our continent's security and challenges the foundations of the international rules-based order.

Other powers are now pulling their own levers, disregarding internationally agreed norms while conflict increases across the globe.

Had Europe delivered support for Ukraine in the months before full-scale Russian invasion began, Russia may not have advanced so far. The lesson is clear: delayed deterrence means weaker deterrence. We cannot afford to make that mistake again.

In the next five years, the European Union must develop the strength to deter real aggression collectively, including from a battle-hardened Russian military. Hybrid attacks have already increased significantly since 2022. If the last two

years were defined by damage to undersea infrastructure, 2025 was the year of airspace violations: balloons, drones and in some cases, fighter jets. Maritime security and work on drone defence have understandably become priority areas for our collective work.

Member States will spend close to €7 trillion on defence over the next decade – the most since the beginning of the Cold War. The European Union's *White Paper for European Defence - Readiness 2030* and recent work on military mobility are the blueprints to transform this funding into the capabilities we need, including to tackle hybrid threats. National governments will always be in the driving seat for defence but EDA can help them steer and do so in convoy, from aggregating demand to connecting governments with industry and identifying areas for collective research and investment.

We are always stronger when we work together and this also makes us a more complementary partner for NATO. The now-over-subscribed Security Action for Europe (SAFE) instrument also encourages European thinking by providing loans to Member States for the development of European defence projects.

As collective work begins across the nine key capability areas identified in the Defence Readiness Roadmap, there are still many hurdles to doing this as fast as required: from mitigating a fragmented European defence industry, to swiftly integrating Ukraine's fresh experience and capabilities with our own. But perhaps the hardest challenge we face is to lessen Europe's dependencies. This applies primarily to China for their supply of raw materials that we need to produce defence equipment.

Only a few months ago, Beijing imposed a temporary export ban on the vital drone components for Ukraine's war effort. Leaving ourselves vulnerable to the possibility of countries turning off the taps is not a sustainable or sensible defence strategy. And it also applies to the United States. For too long we have been too dependent on the U.S. providing us with security.

Work has now begun in earnest to diversify Europe's international partnerships. The positive news is that there are many countries across the world waiting to work with us.

> **"Member States will spend close to €7 trillion on defence over the next decade – the most since the beginning of the Cold War"**

On top of the Security and Defence Partnerships with the United Kingdom and Canada that the EU agreed this year, we are also negotiating more partnerships with like-minded countries across the Indo-Pacific, Africa and Latin America.

In parallel, we are working to strengthen our trade relations and investment across the world to shore up supplies of critical raw materials, including through Global Gateway projects.

European strength and unity are the most important deterrent we can invest in today. But Europe's capacity to convene, negotiate agreements and de-escalate is as important for our ultimate goal: a just and lasting peace in the world.

2026 might be the most dangerous year in decades but this is also why investment in pre-conflict warning and mediation across the globe is also important. To quote Albert Einstein, whose work provided the foundation for nuclear power, "peace cannot be kept by force; it can only be achieved by understanding". To prevent war, we must prepare for war. But peace needs preparation too.

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EU defence readiness: why EDA is **at the forefront**

André Denk is the Chief Executive of the European Defence Agency (EDA). Lieutenant General Denk brings extensive operational and leadership experience, and previously served as EDA's deputy chief. His previous roles include Director of Logistics at the European Union Military Staff and command positions within the German Armed Forces, with deployments under EU, United Nations and NATO missions. He sets out why now is the time to strengthen EDA in a more hostile world.

If there's one acronym that deserves more attention in European Union defence forums, it's EDA – the European Defence Agency. For more than two decades, it's quietly been EU defence's project manager: organising joint training, aligning capability plans, smoothing procurement paths and nudging Member States towards more interoperable defence equipment.

Founded 21 years ago, the Agency was given its mandate in the Treaty on European Union of 2003. That mandate remains our compass today: to support Europe's 27 defence ministries through an intergovernmental structure that is both practical and purposeful.

Our Member States own the Agency, fund its work and meet twice a year at ministerial level to provide strategic direction through the Steering Board. Alongside these meetings, national directors responsible for armaments, capability development, and research and innovation also gather under the Agency's roof. Together, they chart the course for what remains a truly member-driven organisation.

At its heart, the Agency exists to offer a trusted platform for cooperation. We help EU Member States, many of whom are also NATO allies, achieve their shared capability goals while meeting their own national objectives. Our closest partners, including Norway, Switzerland and Ukraine, work with us through special Administrative Arrangements that broaden Europe's defence community.

Fire core tasks, five new areas

Only last year, our Member States agreed a clear set of five core tasks that define our work. First, we help set priorities: identifying what capabilities Europe needs and where effort should be focused. Second, we bring nations together to cooperate on research, technology and

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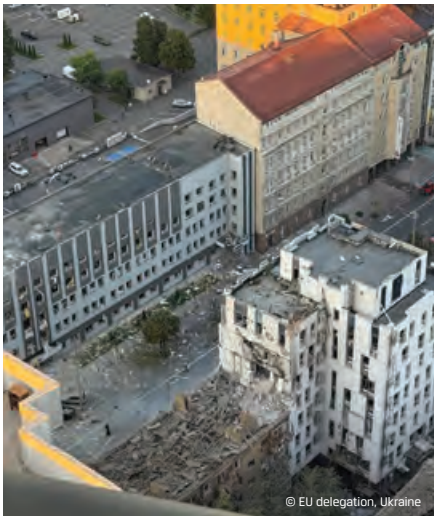
"Cooperation is not a slogan for us; it is practical, hands-on work"


Chief Executive Denk inspects a Russian Geran 2 drone during a visit to Kyiv in July 2025.

innovation – an area that is moving faster than ever. Third, we support capability development, ensuring that concepts turn into real military assets. Fourth, we aggregate national demands to pave the way for joint procurement. And finally, we advocate for Ministries of Defence within wider EU policymaking, ensuring military needs are fully understood – whether in the digital transformation of European airspace or in civilian-driven areas with vital defence implications.

Cooperation is not a slogan for us; it is practical, hands-on work. Take the nine priority capability areas derived from the White Paper on European Defence, Readiness 2030. From integrated air and missile defence to artillery systems, these areas each have dedicated lead nations. Our role is to support them with organisation, expert content and links to our broader programmes.

Another example is our Government-to-Government platform, launched this June. It offers all member states a transparent view of more than 400 existing defence contracts that others have negotiated. It's a number that grows weekly. It has already become an essential tool for identifying opportunities for joint procurement, and it will soon expand to include projects in development and innovation.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Russian missile strikes targeted the EU Mission to Ukraine on 28 August 2025.

Innovation is equally central to our mission. The Hub for European Defence Innovation (HEDI) has become a lively home for ideas, from prizes and hackathons to large-scale gatherings such as this year's Defence Innovation Days in Krakow, which drew 1,000 participants.

Through experimentation campaigns, such as the one held near Rome on drones for logistics and reconnaissance, we help turn promising concepts into deployable capabilities. Our work with the Brave Tech EU initiative is another illustration: a €100 million programme designed to match Ukrainian operational needs with European ingenuity, accelerating solutions from concept to testing and beyond.

Capability development also benefits from deep cooperation. A recent example is the joint effort on loitering munitions, where 18 ministers signed a letter of intent to work together. Since then, we have helped define the capability, gather national requirements, survey European industry and prepare a solid business case for joint procurement – proof, once again, of what can be achieved when nations align their efforts.

Looking ahead, EU's leaders have called for a stronger Agency. In response, we have put forward proposals focused on five areas: **bolstering our role in research and innovation; expanding our support to capability development; enhancing joint procurement; reviewing our internal structures and resources; and deepening cooperation with partners**, including possible new ones such as Canada.

As we take these next steps, our purpose remains straightforward: to help our Member States work together more effectively and to strengthen the EU's collective security. After 21 years, the spirit that founded the Agency is very much alive, and more important than ever.

Building bridges at the crossroads of three continents

Vasilis Palmas has been serving as Minister of Defence since 2024. He brings experience to the role, notably as Deputy Minister to the President of the Republic of Cyprus from 2017 to 2022. With a background in political science and public administration, as well as in the private sector, he speaks to *European Defence Matters* about Cyprus' EU presidency priorities, the island's security challenges, and the pursuit of stability in the Eastern Mediterranean.

With Syria in transition after years of conflict, Libya divided, instability in Lebanon and pressure on democracy in Turkey, as well as the conflict in Gaza, the Eastern Mediterranean faces significant geopolitical challenges. At home, Cyprus' capital, Nicosia, is the last divided city in Europe.

Situated at the crossroads of Europe and the Middle East, Cyprus confronts security issues that reflect the wider ones facing the European Union. As the country takes over the presidency of the Council of the EU for the second time (the first was in 2012) Minister of Defence Vasilis Palmas intends that Cyprus uphold unity, develop readiness and make practical progress across Europe's defence agenda. Cyprus is also contributing to the EU's continued efforts to support Ukraine.

"As the only EU Member State with part of its territory under illegal occupation, Cyprus deeply identifies with the plight of Ukraine and stands in full solidarity with its people," says Palmas. "Ukraine has shown that it is possible to resist aggression even when the odds are unfavourable," he says.

Hope for reunification

The occupation of part of the territory of the Republic of Cyprus stretches back more than 50 years to July 1974, when Turkey invaded the island in violation of international law. Since then, the United Nations Peacekeeping Force in Cyprus (UNFICYP) has monitored the ceasefire between the Turkish forces and the Cyprus National Guard.

> **"Ukraine has shown that it is possible to resist aggression even when the odds are unfavourable"**

Despite the intransigent and unconstructive attitude of Turkey, the Republic of Cyprus remains committed to the reaffirmed position to reach a comprehensive and viable solution based on a bizonal and bicommunal federation with political equality as prescribed by UN Security Council resolutions. So hope for a settlement endures.

Towards this objective, President Nicos Christodoulides has prioritised the resumption of an effective negotiation process under UN auspices with the support

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of the European Union for the reunification of Cyprus.

The Mediterranean crossroads

For Palmas, the island's political and security challenges are inseparable from the wider world.

"Europe's security landscape is changing faster than at any other point in recent history," he says. "The war in Ukraine, the rise of hybrid and cyber threats, instability in our wider neighbourhood and the expansion of conflict into new domains ranging from space to information are redefining how we think about security and defence." These are not distant challenges, the minister stresses. "They affect every European citizen."

Palmas emphasises the need to move from planning to action. "Our goal is clear: to turn Europe's strategies into capabilities, to move from fragmentation to resilience. We want a Europe that can deliver, deter, and defend."

He frames the upcoming presidency around three core priorities *(Also see box overleaf)*.

- **First,** advancing the implementation of the EU Defence Industry Strategy (EDIS) and the Security Action for Europe (SAFE) initiative. These aim to scale the European industrial base, reduce dependencies and deliver capabilities to armed forces faster. Cyprus plans to host high-level conferences and support efforts to deepen cooperation among Member States, EU institutions and like-minded strategic partners.
- **Second,** Cyprus is shining a spotlight on the Eastern Mediterranean for European and transatlantic stability. Palmas underlines that safeguarding maritime routes, undersea cables and critical infrastructure is vital not just for Cyprus but for the EU as a whole.
- **Third,** support for Ukraine will remain central. Cyprus aims to advance European efforts to uphold Ukraine's independence and resilience, contributing to joint European action in security, stability and reconstruction. →

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Greek, Cypriot and U.S. Naval Special Operations Forces (SOF) carry out a joint maritime exercise in the Mediterranean.

Personnel of the 6th Motorised Infantry Brigade take part in 'Silver Falcon 2025' at the Kalo Chorio Firing Range in Cyprus, November 2025.

This dual focus on European cooperation and regional security is rooted in experience. As Palmas puts it: "From Cyprus' perspective, the balance between national responsibility and European coordination is not theoretical; it is lived experience".

Stronger together

As a Member State facing occupation and complex threats, solidarity is the cornerstone of security. Modern challenges, from cyber-attacks to climate-induced migration pressures, cannot be managed by countries acting alone.

Although not a member of NATO, the Republic of Cyprus has supported enhanced EU–NATO cooperation based on openness, transparency, inclusiveness, and full respect for the decision-making autonomy of both organisations. At the same time, Cyprus has strengthened its strategic partnership with the United States, notably through the 2024–2029 Defence Cooperation Roadmap, which focuses on crisis management, maritime security and innovation.

For Palmas, strategic autonomy is about resilience. "This means securing supply chains, advancing technological capacity, and strengthening our industrial base so Europe can maintain peace and prosperity alongside its like-minded partners," he says. But defence cooperation cannot be pursued with third countries whose actions contradict the security and defence interests of the Union and its Member States, he adds. That reflects the presence of Turkish occupation troops on EU territory.

Cyprus' participation in EU defence is not only political but also operational. As an EU Member State since 2004, it engages fully with the Common Security and Defence Policy (CSDP) and instruments such as the European Defence Fund (EDF), which promotes joint research, industrial cooperation and capability development. Under the SAFE Regulation, Cyprus can access €1.18 billion in low-interest loans to enhance defence production capacity and support national modernisation efforts.

Meanwhile, strategic modernisation is visible on the ground. Military infrastructure upgrades, including the Andreas

Cyprus' EU presidency priorities at a glance

› Strengthen European defence industry

Implement EDIS and the SAFE initiative.
Scale Europe's industrial base and deliver capabilities faster.

› Secure the Eastern Mediterranean

Protect maritime routes, undersea cables and critical infrastructure.
Boost crisis response, humanitarian operations and non-combatant evacuations.
Promote regional stability and EU readiness.

› Support Ukraine

Uphold Ukraine's independence and resilience.
Contribute to joint European actions on security, stability and reconstruction.
Maintain support for Ukraine as a central EU priority.

"Europe's security landscape is changing faster than at any point in recent history"

Papandreou Air Base in Paphos and the Evangelos Florakis Naval Base in Mari, are central to Cyprus' planning. Cyprus, at the crossroads of three continents, is positioning itself as a bridge between Europe and the Middle East.

EDA, EDF, ECV, EW: a hearty alphabet soup

Cyprus is active in the collaborative, the European Defence Agency (EDA)-led process of developing land, maritime, cyber and air capabilities. Cyprus helped revitalise the MARSUR community – MARSUR being a maritime surveillance information-exchange system launched by EDA with participating Member States – and is helping to prepare its next-generation systems.

Nicosia has signed letters of intent to jointly procure loitering munitions, develop integrated air missile defence, a future European Combat Vessel (ECV) and electronic warfare (EW). Cyprus uses the EDA's satellite communication services.

President Christodoulides has underlined that Cyprus has a promising domestic defence industry, which the government is committed to further strengthening. At the DEFEA 2025 exhibition in Athens, the Cypriot pavilion highlighted companies already exporting to other EU Member States.

On 26–27 February 2026, Cyprus will also host under its EU presidency: 'BATTLEFIELD ReDEFiNED 2026 – Modern Technologies with Dual-Use Potential for Enhancing Security, Defence and Space Resilience'. The event, with the support of the European Commission, provides a platform for engagement between the Cypriot defence industry and international partners.

Meanwhile, a Cyprus Defence Industry Council has recently been established, acting in an advisory role, with a primary mission to provide recommendations to the government regarding its policy planning in the field of defence industry development. "Our expanding network of over 30 domestic companies, ranked seventh in the EU for participation in EDF projects, shows that Cyprus is ready to deliver," Palmas says.


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Cyprus is championing industrial integration, a competitive EU Single Market for defence, and technological sovereignty, while maintaining openness to partnerships with like-minded countries that share the Union's values. "Reducing dependencies does not mean closing ourselves off; it means strengthening Europe's ability to act collectively and effectively," he says.

So Cyprus' EU presidency is more than a political milestone. It shows how a small EU Member State in times of geopolitical complexity can lead on resilience, defence, and cooperation. "Ukraine reminds us that Europe's security depends on collective readiness, trust and solidarity," he adds.

For Cyprus, these principles guide a Member State that, though shaped by division, is determined to play an active role in promoting stability across the region and Europe.

How Cyprus works with EDA

Capability development & participation:

- Active in land domain, cybersecurity and air transport within the Capability and Technology Groups, and projects related to loitering munitions.
- Signed four letters of intent for: loitering munitions, the European Combat Vessel, integrated air and missile defence, and electronic warfare.
- Engaged in testing and evaluating advanced drones and loitering munitions.
- Contributed to integrated air and missile defence efforts, including short-term needs such as ground-based air defence and counter-unmanned aircraft systems, and radar systems.
- Active in defence energy and sustainability initiatives, including work on energy resilience, energy efficiency and circular-economy approaches in the defence sector.
- Participating in Military Airworthiness Forum and activities.
- Active in Military Mobility and related initiatives such as the Cross Border Movement Permission.

Joint procurement:

- EU Satellite Communications Market: participating since April 2015.
- Joint procurement of flight suits: project started following a letter from the Cyprus Ministry of Defence to EDA in August 2019; first delivery ceremony took place in Cyprus in June 2025.
- Maritime Surveillance: One of the longest-running projects undertaken by EDA with the participation of Cyprus.

Europe enters the **Drone Age**

Unmanned systems are **redefining** warfare

There are times when today's battlefield no longer erupts with the roar of aircraft, engines and artillery, but with the low hum of machines. In Ukraine's brave fight against Russia, an assault can begin not just with soldiers advancing, but with a swarm of drones sweeping silently over the frontlines.

While core Western equipment and doctrine is still vital, unmanned systems are now being developed across all branches of the military.

They give troops real-time awareness and precision targeting, in the air, on land and also underwater. Even some logistics have gone robotic, with rugged machines hauling ammunition.

***European Defence Matters* has been following how European firms and militaries are fast-tracking new technologies from concept to battlefield, from Tallinn to Troia via Montelibretti, near Rome.**

But this technological ballet hangs on a fragile thread: the invisible war in the electromagnetic spectrum. Every command link and video feed is a vulnerability. Enemy electronic warfare can jam, intercept and trace signals, turning advanced systems into wreckage.

So drones should not replace conventional NATO firepower, but should be optimised to support and enable Europe's armed forces.

From testing to field use: How the European Defence Agency (EDA) is helping the EU **move faster**

ITALY Unmanned ground and aerial systems in live trials across all domains

EDA launched its first Operational Experimentation (OPEX) campaign in July 2025. Held near Rome at the Italian Army's Multifunctional Experimentation Centre in Montelibretti, the live trials were coordinated by EDA's Hub for EU Defence Innovation (HEDI).

Companies including Beyond Vision from Portugal, Altus LSA from Greece, Schiebel from Austria, Alysis from Spain, Piap from Poland and Germany's ARX Robotics (Germany) carried out simulations focused on autonomous logistics and last-mile delivery in lifelike scenarios.

PORTUGAL The world's largest exercise for unmanned maritime systems

EDA, NATO and the Portuguese Navy co-hosted the 15th Robotic Experimentation and Prototyping using Maritime Unmanned Systems (REPMUS), off the coast of Portugal in September 2025. The Portuguese-led event brought together 24 nations to test around 300 unmanned systems across sea, air and land. It linked directly with NATO's Dynamic Messenger exercise for the first time to combine experimental testing with operational training.

Participants trialled robotics and AI in real-world conditions, including electronic warfare, GPS-denied operations, amphibious landings, dummy mines and coordinated swarm missions with multiple drones. The exercise also highlighted interoperability challenges, prompting EDA-led seminars on standards and best practices, as well as the SARUMS safety and regulatory framework for unmanned maritime systems.

ESTONIA A European community of people creating and using defence robotics

EDA brought together the Autonomous Systems Community of Interest (ASCI) in November 2025 for the second year running. This time in Tallinn, the forum gathered Member States, NATO, Ukraine and industry to discuss ways to move faster from research to deployment.

Discussions focused on how shared experimentation and joint testing can help Member States and companies validate emerging concepts and integrate them into military structures. An emphasis was placed on the role of trustworthy AI, including the need for secure, high-quality datasets, standardised training methods and robust testing frameworks.

Europe's defence robotics: **breaking out** of the silos

As more European tech firms make the leap into defence, EDA believes that advances in autonomous systems, artificial intelligence, advanced computing and microelectronics demand a coherent, coordinated approach.

On a rainy evening in Tallinn, bright lights shine inside a small factory as two men with tools adjust the caterpillar treads of a half-built robot. Assembled by hand, the unmanned ground vehicle is surprising in its simplicity. Between the robot's two wide, green rubber tracks, there is nothing in the middle but a metal shelf – and that is exactly the point.

Designed by Estonia's Milrem Robotics to be 'modular', the remotely-controlled, diesel/electric 'Themis' can be outfitted with a small canon or carry drones and equipment, or even evacuate wounded soldiers. When necessary, it can be autonomous, following a series of way points or simply come back to base.

Themis has been sold to 19 militaries, including eight NATO allies such as France and Germany and is being used in Ukraine and other countries. It has sometimes been a vertiginous trajectory since being established in 2013. "Milrem started with two engineers, and one day they came to me and said, we need a third engineer. And I asked: what would he do?," jokes Milrem's CEO Kuldar Vaarsi.

Making a Skype call

As part of the shift in warfare to take humans out of the battlefield when possible, tech-savvy Estonia – a former Soviet state that borders Russia – has been leading the way. With a digitally literate workforce and a tech start-up culture, Estonia is moving into defence systems reliant on robotics, AI and cyber.

From tethered drones to long-distance, remote-control cars, Estonian engineers have created a range of potential suppliers to EU armed forces, despite a lack of access to financing and what many see as overregulation in a sector traditionally beset by moral objections.

Jaan Viru, an Estonian engineer and founder of Crystal Space, which makes camera systems for loitering munitions, says Skype – sold to Microsoft in 2011 – left a strong legacy in Estonia. "But it is still hard to compete with the United States due to a lack of venture capital," Viru says.

Start-ups across Europe face bureaucratic hurdles and slow funding. Matthias Luha of KrattWorks notes that it took two years to secure an EU grant, while Dario Pedro of Beyond Vision says excessive regulation slowed testing in Portugal.

Even in Germany, frequency allocation permits can take six months, and importing drones between EU countries is slow, according to Marco Lotz of Quantum Systems. Luha adds: "U.S. start-ups can raise five million dollars. In Europe, we sometimes must make do with fifty thousand," though he notes financing is becoming easier to obtain.

The THEMIS (Tracked Hybrid Modular Infantry System) at Milrem Robotics. It is the company's flagship multi-mission Unmanned Ground Vehicle (UGV).

"Autonomous and unmanned systems are now critical to protecting Europe"

Do you know your APAS from your ASCI?

So the EU faces a quandary. "Autonomous and unmanned systems are now critical to protecting Europe, but development remains costly, slow and not at the scale that the EU needs," says Nathalie Guichard, EDA's Director of Research, Technology and Innovation.

There is progress, however. "From the technology perspective, EU industry is improving. It is growing rapidly, and some companies are a reference point worldwide. Just look at Milrem," says Mario Martinho, EDA's Project Officer for Land Systems Technologies. Before EDA started collaborative projects on unmanned ground systems with EU funding, the industry worked mainly in silos. "Now the landscape has changed completely," Martinho adds.

The EDA Action Plan on Autonomous Systems (APAS) is an important tool. Though legally non-binding, it covers land, air and maritime domains – and their intersections. APAS guides Member States with three main goals *(see below)*.

Not to be confused with the many other acronyms of EU defence, the Autonomous Systems Community of Interest (ASCI) is part of that approach, linking civilian and military efforts and fostering essential partnerships. Several EU projects illustrate this shift, with multiple developers pooling expertise rather than working in isolation.

EDA's Guichard highlights the importance of strong networks between Member States and industry. HEDI encourages knowledge sharing and fosters ecosystems where innovation can thrive. Dual-use technologies are a particular focus: civilian tools for agriculture or logistics can be adapted for defence, letting the EU leverage broader innovation.

Open architecture and modularity are equally crucial. Standardised components allow multiple suppliers to integrate into the same system, reducing fragmentation and accelerating development. An autonomous vehicle from one country can work seamlessly with platforms from another or be upgraded more easily as technology evolves.

Martinho and Guichard agree: autonomous systems are here to stay, and the EU must innovate, stay agile and act collectively. The next decade will test its ability to balance ambition with responsibility. Guichard warns: "We cannot afford to let bureaucracy slow innovation."

The European Union aims to enhance its defence readiness by 2030, focusing on closing capability gaps and supporting Member States in high-intensity warfare. Areas include autonomous solutions and AI, cyber and electronic warfare, drones, ground combat and maritime operations.

APAS has three main goals:

- Improving individual unmanned systems;
- Enabling cooperation between autonomous platforms;
- Fostering manned–unmanned teaming, where humans and robots work in concert.

The plan includes 94 action lines spanning technology development, testing, verification, certification, regulation, standardisation and taxonomy. Rigorous experimentation ensures prototypes quickly evolve into operational capability.

"I don't see unmanned maritime systems replacing submarines in the short run"

NATO and EDA meet in Europe's unmanned maritime systems laboratory

Robotic Experimentation and Prototyping using Maritime Unmanned Systems (REPMUS) is the world's largest exercise for unmanned maritime systems. It demonstrates how NATO allies and EU Member States are helping shape the future of unmanned maritime warfare, providing a platform for innovation, collaboration, and interoperability.

From the deck of the Portuguese patrol vessel Figueira da Foz, a cluster of reporters watch as a small, dark object glides across the water's surface. Moments later, the shape emerges: an autonomous underwater vehicle, the Greyshark, capable of seabed mapping, mine detection with AI, and patrolling critical infrastructure.

Welcome to REPMUS 2025, the 15th edition. A Portuguese Navy-led exercise, it is co-organised by Oporto University (FEUP), NATO Centre for Maritime Research and Experimentation (CMRE) and NATO Joint Capability Group Maritime Unmanned Systems (JCGMUS) and EDA. It takes place in the waters south of Lisbon every September, gaining in size every year. In 2025, it brought together 24 nations and nearly 300 different autonomous platforms across sea, air and land.

For the first time, NATO's operational exercise Dynamic Messenger was directly linked with REPMUS, merging operational training with experimental testing. Led by NATO's Allied Command Transformation (ACT) and Allied Maritime Command (MARCOM), the exercise allowed both militaries and industry to trial robotics and artificial intelligence in real-world scenarios, including electronic jamming and dummy underwater mines. Ships from Standing NATO Maritime Group 1 (SNMG1) also joined, highlighting the alliance's focus on maritime readiness.

Captain Nuno Palmeiro Ribeiro, Director of the Portuguese Navy Operational Experimentation Centre (CEOM), explains: "This was an opportunity to experiment on unmanned vehicles across all domains and in a real environment. What's special about this zone is that we can do experimentation that is not possible elsewhere."

Swarms, rockets and hydrogen airships

At Dynamic Messenger, the red and blue teams deployed swarms of unmanned vehicles above and below the waves. Scenarios included Intelligence, Surveillance and Reconnaissance (ISR) in coastal zones, electronic warfare in GPS-denied environments, and amphibious landings supported by robotic scouts and logistics drones. One highlight saw multiple aerial drones performing coordinated swarm operations.

The Ukrainian DELTA combat management system, used to coordinate the red team, was successfully integrated with NATO's STANAG 4817 open standard, allowing over a hundred drones, submarines and aircraft to share information in real time.

Juergen Scraback, who heads maritime capability development at EDA, highlights the significance of working with so many nations from across NATO and the EU. "REPMUS allows us to link unmanned systems so that we are not working in stove pipes. Operational centres from Berlin, London, Kyiv are meanwhile exchanging data. This is really the key: this network."

To that end, EDA led the second edition of its Unmanned Surface Vessels (USV) Sense and Avoid experimentation exercise and advanced work on

Aerial and underwater drones at REPMUS off the Portuguese coast in September 2025.

the Safety and Regulations for European Unmanned Maritime Systems (SARUMS) framework, based on EDA's Best Practice Guide. They are designed to provide guidance on safety, design, operations and legal compliance.

Scraback, a German naval officer with 39 years of experience, says that developing standards will greatly improve interoperability between forces. "We would like to develop EU standards. At the moment, you cannot charge electric-powered unmanned systems universally. They all have different batteries and chargers."

He also stresses the integration of Permanent Structure Cooperation (PESCO) projects into REPMUS: "We have five underwater PESCO projects running. We want to avoid siloed development and enhance information exchange. For example, sensors developed for one project could be used for another."

Fail and improve

The measure of success at REPMUS lies in adaptation. How quickly can systems learn, adjust, and be redeployed? 'Spiral development,' as military technologists call it, is the doctrine of the day: build, test, fail, improve, repeat. Scraback highlighted the value of learning: "If you have a failure, then you have success, because you can work on your mistakes."

Several start-ups supported by NATO's Defence Innovation Accelerator for the North Atlantic (DIANA) used the event to test technologies for communications resilience, protecting undersea infrastructure and improving mine countermeasures. The Faculty of Engineering at the University of Porto and NATO's Centre for Maritime Research and Experimentation were also contributors.

Still, there are limits of autonomy in naval operations. "I personally don't see huge unmanned maritime systems replacing submarines in the near future," Scraback says. "But we are thinking about deploying unmanned systems from submarines, using them to extend range and gather sensor data."

He also emphasises the strategic and political dimension of manned systems: "Showing the flag is a political demonstration of support for an ally, for freedom of navigation. You cannot do that in the same way with unmanned systems. If a ship is attacked, that's a totally different story."

REPMUS Technology & participation snapshot

Technology on display:

- Rheinmetall Greyshark AUV: Torpedo-shaped, 6.5 metres, seabed mapping, mine detection.
- Hunter-02 Rocket (Portugal): Mach 1 test flight, refining guidance and control systems.
- Kelluu Hydrogen Airship (Finland): Twelve-metre floating drone bridging sensor networks and satellite coverage.

Unmanned platforms:

- 61 aerial drones.
- 57 unmanned surface vessels.

Operational highlights:

- NATO-EU joint exercises linking experimental robotics with operational missions.
- ISR, electronic warfare and amphibious support.
- Testing of interoperability and adherence to EDA Best Practice Guides.

Frankenburg: **Rocket science** for the drone age

Kusti Salm is the Chief Executive Officer of Estonian-based Frankenburg Technologies and a former permanent secretary of the Estonian Ministry of Defence between 2021–2024. Salm – who worked at EDA in 2009 – talks to *European Defence Matters* about creating a tool against the drones that now dominate modern conflicts, and "redefining the economics of air defence."

Since September, European Union governments have faced an unsettling new reality: small Russian drones slipping into their airspace, halting airports, and probing military installations. The 19 drones that crossed into Poland were the worst violation of NATO skies in 75 years. Suspected Russian drones have since appeared in Belgium, Denmark, Germany and Romania, although the Kremlin denies any involvement.

Many of the drones are very cheap to make. Intercepting them with missiles designed for jets or ballistic threats, which cost hundreds of thousands or even millions of euros per shot, makes little financial sense. For the EU's armed forces, cheap drones demand a new, economically viable layer of air defence.

Might a defence start-up in the Baltics offer a solution?

Frankenburg Technologies seems to have impeccable timing at the very least. Founded in early 2024 by Estonian entrepreneur Taavi Madiberk and led by former senior Estonian Ministry of Defence official Kusti Salm, the company's goal is to develop affordable, scalable missile systems capable of countering drones. That means a missile that is more than 10 times cheaper than today's.

"It's about redefining the economics of air defence ... and this is, frankly speaking, the only reason why the Russians are putting all their efforts into drone manufacturing," Salm says. Estimates suggest that Russia produced more than 6,000 'one-way attack' unmanned aerial vehicles (UAVs) in 2024, with some days in 2025 seeing between 500 and 700 deployed.

Frankenburg had only been running for half a year when Salm was approached by the founder of the company. "It was where some of my closest co-workers in Estonian defence were already working, including the former chief of defence and former deputy chief of defence," he says, adding that other employees include a former Polish defence chief and retired German Lieutenant General Juergen-Joachim von Sandrart, a former NATO commander. Frankenburg has since grown to a team of over 60 specialists across its headquarters in Estonia, Denmark, Germany, Latvia, Lithuania, Poland, plus non-EU nations Britain and Ukraine.

"We want to produce rapid, cost-effective surface-to-air missile systems for a market that has never been affordable"

Salm stresses that this depth of experience is not merely ceremonial; it informs every engineering and operational decision. The company leadership team includes Director of Engineering Andreas Bappert, who was previously the chief engineer of the Iris-T system at Diehl Defence. Juhan Tenisson, who spent more than 20 years in the automotive industry managing large-scale production and supply chains, heads production. Recently, notable engineers from MBDA from Britain joined the Estonian team.

Mark my words

Salm does not underestimate the work ahead. "Building missiles is hard. It really is rocket science," he says. "There are no universities where you can actually learn to build guided missiles. There are only a few companies where this can be done, and there are very, very few people in Europe who have done it at the system level."

Still, Frankenburg's first breakthrough, the Mark 1 missile, came remarkably swiftly. Designed within a year of the company's foundation, the Mark 1's production costs are in the low five-figure range, Salm says. It is the smallest guided missile ever built, according to the company. Its development relied heavily on rapid prototyping, using an approach more akin to consumer tech than traditional defence programmes.

Kusti Salm

Unlike conventional projects, where test launches occur a few times a year, the Frankenburg team tested missiles several times a month on two NATO-authorised ranges. This allowed speedy iteration, integrating improvements in near real time and reducing development cycles from decades to months. Salm notes that sacrifices were made deliberately: the Mark 1 is not designed to withstand Arctic or Saharan temperatures, or for long-term warehouse storage. That can add up to 30% of a traditional missile's cost, he says.

Mark 1 is not intended to challenge conventional aircraft or ballistic missiles either; it is a tool against the drones that dominate today's wars.

SHELTER FROM THE SWARM

"Mark 1 is specifically designed for the age of drones. And this is where the main benefits of the missile system come from. If we look at the competition, those short-range systems were all built against helicopters, which means that many of the technologies are already 40 to 50 years old."

Already selling to one NATO ally, Frankenburg's pitch is scalability and simplicity. Production could reach 100 units per day, with aspirations for thousands. The system can be mounted on mobile platforms or static installations to protect critical national infrastructure. To defend the more than 2,000 critical infrastructure sites along NATO's eastern flank from a single large-scale attack, roughly 550 missiles would be required per site, analysts say.

"We are mission-oriented. Mark 1 is a short-range missile-based interceptor designed specifically to counter low- and low-flying drone threats," Salm says. It uses solid rocket fuel, an AI-powered guidance system, and is many times faster than other drone-based interceptors. Designed to detonate one to two metres from the target, it operates within a two-kilometre range.

Anti-cruise, anti-ballistic, anti-aircraft

Looking ahead, Frankenburg aims to develop a new generation of European missiles that promises even faster development cycles and greater affordability. "Our main innovation is not only the missile itself, but how we build it," Salm says.

"We want to bring fast development times and rapid feature iterations of the next variants of missiles – not after every 10 years, but essentially after every 10 months," Salm says. He adds that the aim is to make missile systems cheaper – including longer-range interceptors – and to address threats such as anti-cruise, anti-ballistic, and anti-aircraft missiles. "We want to produce high-speed, cost-effective surface-to-air missile systems for a market that has never been affordable," he says.

As the age of drones continues to unfold, Frankenburg Technologies could represent a model of innovation tailored to the modern battlefield: fast, scalable, and deeply informed by operational expertise. From a small start-up to a continental force in defence technology, it aims to demonstrate, at the very least, that agility and design can help redefine Europe's military capabilities.

Frankenburg at a glance

- **CEO:** Kusti Salm (former Permanent Secretary, Estonian Ministry of Defence).
- **Specialisation:** Development of low-cost, high-volume interceptor missiles for counter-unmanned aerial systems (C-UAS).
- **Product:** Mark 1 – a solid-fuel, AI-guided missile designed to neutralise drones and loitering munitions.
- **Production:** Scale up to several hundred units per week.
- **Partnerships:** Advanced Protection Systems (APS) – collaboration on integrated C-UAS.
- **Developments:** Initiated missile production in Ukraine; will invest €50 million in Britain for research and development into low-cost rocket motors.

FOCUS: UKRAINE'S UNMANNED SYSTEMS FORCES

Army of drones: nothing without **human control**

In December 2024, Ukrainian forces reportedly made history with the world's first fully unmanned assault on Russian positions, deploying ground-based robots alongside First Person View (FPV) drones, which are essentially the infantry of drone warfare. At the heart of this innovation is Ukraine's Unmanned Systems Forces, the first military branch in the world devoted entirely to unmanned operations, integrating aerial, ground and naval drones into a single, coordinated force.

Nemesis, Flying Skull, Rarog. These are some of the regiments and brigades of the world's first military branch for unmanned and robotic systems in combat operations.

Unwilling to follow Russia's lead and sacrifice horrendous numbers of casualties on the battlefield, Ukraine has produced an adaptation straight out of science fiction.

Formally organised into a 12-unit grouping in June 2025, the Unmanned Systems Forces consolidates air, land and maritime drones into a single operational framework, turning what began as ad hoc ingenuity into an integrated instrument of statecraft and combat. The aim is to scale up as fast as possible.

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> **"Every euro spent on unmanned systems can produce more than one hundred times that in terms of enemy losses"**

Dmytro Chumak, an officer in the Unmanned Systems Forces Command, is in a daily race to be one step ahead as Russia relentlessly adapts to the latest Ukrainian battlefield technology. He has been briefing the Autonomous Systems Community of Interest (ASCI).

"Every day we are in the innovation cycle," says Chumak.

That iterative instinct of rapid prototyping, constant feedback from the front and an almost industrial tempo of learning underpins the force.

Between June and August the grouping accounted for more than 30% targets for the Armed Forces of Ukraine, a jump of roughly 15% on May. Open-source research cited by Ukrainian commanders estimate the Unmanned Systems Forces has destroyed Russian assets at a rate of about $2.5 billion a month.

As Chumak points out, the economics are stark: "Every euro spent on unmanned systems can produce more than one hundred times that in terms of enemy losses."

The Ukrainian-made Skyeton Raybird-3 reconnaissance drone in Kyiv on 25 August 2024.

"Open-source research cited by Ukrainian commanders estimate the Unmanned Systems Forces has destroyed Russian assets at a rate of about $2.5 billion a month"

Kill zone

But it is not a robot army or a gamer's dream.

Training Ukrainian pilots is at the heart of this force. Instructors move between the fighting line and the classroom, returning with fresh lessons that immediately reshape doctrine.

"The classroom is the place where a soldier's skills and mental discipline, become the fundamental condition for combat success," Chumak says. Those same operators must marry physical courage with nimble technical judgement, whether piloting FPV attack drones at night or coordinating multi-platform strikes beyond Russian lines.

For the moment, the Unmanned Systems Forces are at their best close to the frontline. Beyond 20 kilometres, engagements become sporadic. That matters because Ukraine aims to create a 15-kilometre drone-patrolled 'kill zone' – where enemy forces can be destroyed – along the front lines. That would make it highly difficult to mass troops for large-scale offensives.

Closing that gap has become the programme's strategic imperative. Extended-range strike and reconnaissance capabilities would push Ukraine's reach into the contested zones where enemy logistics and command nodes are concentrated.

Boundless ... at a cost

Autonomy, Chumak insists, is not a novelty but an operational necessity.

In practice that means building a system of sensors, high-speed data fusion and battlefield management so autonomous weapons can be reliable, rapid and responsive to changing conditions. The challenge is not merely technical; it is institutional and industrial. Interoperable standards, resilient supply chains and international partnerships will be required to scale systems beyond Ukraine's shores.

Perhaps the most consequential lesson is methodological. Ukraine's unmanned strategy is hybrid: ingenuity, training, state direction and private industry converging in an accelerated research and development loop. For the Autonomous Systems Community of Interest watching from abroad, the question is not if, but when, such a force could be part of EU arsenals.

Ukraine's Unmanned Systems Forces demonstrate how a nation under pressure can turn protection for human life and a limited manpower into an asymmetric advantage. But Kyiv and its European allies must be able to finance it. "The amount of money needed to develop this is extremely high, but the investments will deliver results immediately," Chumak says.

Estonians have posted anti-war banners outside the Russian embassy in Tallinn's historic centre.

When the most important value is **human life**

Since Russia's full-scale invasion in February 2022, the Ukrainian army has demonstrated just how decisive drones have become on the modern battlefield. The European Union and NATO have much to glean from Ukraine's experience.

Ukraine's military drone industry has transformed dramatically, evolving from a modest sector with less than seven companies producing unmanned aerial systems (UAV)s before 2022. Today, Ukraine boasts more than 500, according to official Ukrainian figures. From having no home-grown makers of unmanned ground systems (UGS)s, Ukraine now counts more than 100.

While exact figures are unavailable, the pace of change is stark: domestic drone production is now measured in millions rather than thousands.

New legislation, streamlined approvals and European investments have helped incentivise production.

State initiatives – notably a state-owned accelerator called Brave One – and targeted grant programmes have steered firms towards priority technologies, such as UAVs and missile development.

Training and testing schemes have widened participation too: specialist centres can provide operator instruction. The 'Iron Range' is a free service that allows Ukrainian arms and equipment manufacturers to quickly test and refine their products. It provides access to professional trials, evaluation by military research experts and fully equipped test sites. There is also feedback throughout the design process.

Problems remain. Lack of standardisation, speed versus intellectual property rights, and supply-chains are all daily issues. But officials argue the industrial surge has both strengthened Ukraine's defence and created capabilities of strategic value to Europe.