Jon-Wyatt Matlack Sebastian Schwartz Oliver Gill June 26th, 2025

# Europe has much to learn from Ukraine's drone warfare ecosystem

*Drones have played a pivotal role in Ukraine's defence during the Russia-Ukraine war.* **Jon-Wyatt Matlack, Sebastian Schwartz** *and* **Oliver Gill** *argue the drone warfare ecosystem Ukraine has rapidly developed offers some powerful lessons for Europe.*

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On 2 June 2025, the UK published a new Strategic Defence Review. The review articulates five guiding principles: moving towards warfighting readiness, providing an engine for economic growth, adopting a "NATO first" strategic posture, pursuing UK innovation driven by lessons from Ukraine, and embracing a whole-of-society approach to defence.

A question the review implicitly raises is who the preferred future partners should be for UK security. It walks a tight rope in this context, noting that the United States "is the UK's closest defence and security ally", but quietly admitting that "the United States' security priorities are changing" to pivot towards the Pacific. Yet taking the review at its word, two of its five calls to action align with the core arguments we make in a recent report published by LSE IDEAS, namely that the UK should learn lessons from Ukraine and adopt a whole-of-society approach to defence.

# Ukraine's drone warfare ecosystem

Our report explores Ukraine's drone warfare ecosystem and its diverse actors. Unmanned systems like drones have played a pivotal role in the war between Russia and Ukraine. Yet while drones have captured the attention of the world, it's important to consider the role of the actors and processes that support their use.

We argue that drones alone do not generate capability and that an ecosystem of practitioners is needed. The adaptability of drones comes from rapid feedback loops between users and producers, enabled by a capable human value chain. Ukraine's drone warfare ecosystem incorporates a wide

range of stakeholders, including defence/tech industries and the military, as well as civilian expertise and multilateral state cooperation. This support structure – the "crew" behind the drones – is just as important as the weapon systems themselves.

The imperative for other countries to follow Ukraine's lead and embrace these systems is accelerating. But if the UK wants to learn these lessons, it must act now. Ukraine's circle of drone practitioners is diminishing on the battlefield every day. Failure to engage would mean forfeiting this accumulated expertise to Europe's adversaries.

# Speed, scale and urgency

Our research draws on primary interviews with practitioners conducted on the ground in Ukraine in the third quarter of 2024. Our dataset includes input from senior commanders in the Armed Forces of Ukraine, political advisors, and officials from the Ministry of Defence of Ukraine, as well as perspectives from frontline drone pilots and drone school instructors. In short – the people comprising the drone ecosystem.

We focus on three aspects of Ukraine's drone ecosystem that NATO countries must fully comprehend: speed, scale and urgency. First, it is important to understand that Ukraine's drone expertise originated in a highly decentralised manner. Civilian-run drone schools, brigade-level procurement, ad hoc workshops and production centres, and volunteer units operating independently are not outliers — they are the norm. Originally, finding drone innovators was more a matter of network reach than institutional access. This bottom-up structure reflects cultural traits, not a breakdown of military control.

Second, roles in this ecosystem are fluid. Drone instructors are often ex-soldiers who still rotate through frontline units, updating their knowledge and validating tactics in the field. This feedback loop feeds directly back into training. Civilian volunteers then absorb and apply these lessons, increasing public ownership of the war effort and blurring the lines between civilian and combatant innovation. A recent report by the Sahaidachnyi Security Centre confirms the importance of civil society's role in accelerating drone innovation.

Third, the ecosystem moves fast – far faster than traditional NATO structures. Borrowing from software development, private-sector talent integrates seamlessly into the defence space in what we call "War DevOps". Because drones are inherent dual-use goods, civilian technologists become key drivers of battlefield adaptation. Hundreds of drone variants cycle through combat testing and obsolescence in weeks, sometimes days, as Russian countermeasures drive continuous redesign. This pace is only possible through an agile human network that enables rapid ideation and iteration.

# A new special relationship?

NATO is built on the belief that the security challenges posed by Russia can only be solved in conjunction with allies. Yet we detect in UK and NATO defence circles the effects of inertia and even apprehension when faced with adapting to Ukraine's fast moving and decentralised research and development, procurement and production structures – and the Ukrainians themselves are aware of this problem.

Currently, there are more than 200 developed types of Ukrainian unmanned aerial vehicle. While this has allowed Ukraine to rapidly prototype and innovate, it comes at the cost of efficiency. It is understood that Ukraine is in the process of synthesising the 20-30 most adaptable and effective systems in an effort to boost production and allow for exports to be sent to allies.

In this vein, Ukraine recently announced that it will begin foreign production and exporting of proprietary defence technologies to preferred European and NATO partners this year. Ukraine's allies should make use of this. And as Europe begins to shift its somewhat rusty defence industry into gear, it should not forget Ukraine's own industrial capacity.

The resolve to systematically expand Europe's defence capabilities and deepen cooperation has been visible in recent months at events like the Chatham House London Conference and the Kiel International Seapower Symposium (KISS). The significance of the latter event was inadvertently increased by the unceremonious cancellation of the 56-year-old International Seapower Symposium traditionally hosted by the United States Navy in Newport, Rhode Island.

There was strong representation from the United States Navy at KISS, and military-to-military transatlantic cooperation remains steadfast despite the current political climate within NATO. But the transatlantic alliance is undeniably strained. This was acutely embodied in March by J.D. Vance's dismissive comments on the UK as "some random country". Britain should consider deepening security cooperation with countries eager to intensify, rather than dismantle, their political partnerships.

There is already a solid basis for Britain to develop a closer security relationship with Ukraine, as shown, for instance, by the UK's co-leadership of the drone coalition. This would be invaluable to the UK given Ukraine boasts Europe's largest and most experienced conventional army. Our research demonstrates that Ukraine – if empowered to survive – will become a crucial leader in European defence technology capabilities.

# Lessons for Europe

The lessons from Ukraine's drone ecosystem are applicable to all domains: sea, land, air and space. While our report critically examines first person view (FPV) drones, the main differentiator of unmanned systems lies in software and battle management systems that interlink them. Classical silos separating battle domains need urgent redressing in this context.

The structures that propel War DevOps are the primary facilitator of military innovation. Openness to interdisciplinary, iterative approaches to the development of drones – and other military systems – are key to successfully tackling future security challenges. Crucially, collaboration needs to focus on those experts and practitioners who understand this technology best. The good news is that the necessary structures can be built in peacetime. The alternative – learning these lessons on the field of battle – is costly, as Ukraine has valiantly demonstrated.

The exact roles and effects of drones in future wars is uncertain. What is certain is that ignoring them – and the people building them – would be both a strategic error and a missed opportunity. Ukraine's War DevOps structures offer critical lessons for European defence reform. Material support and structured collaboration with Ukraine's drone ecosystem serve shared interests. Western military innovation does not have a monopoly on good ideas – and techno-optimism alone will not win future conflicts. Preserving Ukraine's ecosystem strengthens NATO, while ignoring it strengthens Russia.

*For more information, see the authors' accompanying report published by LSE IDEAS.*

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*Note: This article gives the views of the authors, not the position of EUROPP – European Politics and Policy or the London School of Economics. Featured image credit: Parilov / Shutterstock.com*

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## About the author

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Jon-Wyatt Matlack is a PhD candidate at the University of Regensburg and former Anthony Smith Fellow at LSE IDEAS, completing a dissertation on corps-level training exercises of the German and U.S. armies in the Cold War. He is also an associate researcher at the Leibniz Science Campus Regensburg and affiliate of the Leibniz Institute for East and Southeast European Studies. He publishes essays and policy papers concerning strategic communication of the U.S. Navy, Russian training exercises and Ukraine's drone warfare ecosystem. His latest book is Sovereignty through Practice (Routledge: 2025).

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Sebastian Schwartz is an independent researcher specialising in the role of technology in peace and conflict studies. His previous publications investigate dual-use aspects in the development of autonomous systems and the role of unmanned systems in maritime security. Working in the private sector as an AI expert, his research interests lie in autonomous systems, unmanned systems, human-machine teaming, the automation of war and the social impact of autonomous systems.

**Oliver Gill**

Oliver Gill is Programmes Manager and Researcher at LSE IDEAS where he delivers a portfolio of capacity building programmes for partner institutions and government in international relations, foreign policy and diplomacy. After completing a master's degree in international relations at King's College London with a focus on information warfare and AI, his research now focuses on Black Sea maritime security, Ukrainian defence innovation, information and influence operations, and emerging and disruptive technologies' impact on security.

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