

Teaching the humans in the loop:
Supporting and integrating Ukraine's
unmanned systems training into
Europe's Security Architecture

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Executive Summary

Debates and actions to procure unmanned systems and adopt them across domains are gaining traction. What, however, has remained chronically under-researched is the manning of unmanned systems (UxS) and the training of their operators. Owing to the rapid pace of innovation intervals of UxS, new modalities of training need to be considered by all European militaries to adapt to drone warfare. Traditional approaches to military training are linear processes that start with a weapon system and result in a static end user. We argue for a re-appraisal of this process. In this report, we examine what European partners can learn from the Armed Forces of Ukraine's implementation of UxS training. Consequently, we call for institutionalising a drone training-industrial complex for unmanned systems in Europe to implement these lessons. The ultimate output of such training should not merely be effective systems, but above all, adaptive soldiers. It is estimated that up to 80% of a mission's success is determined by the skill, experience, and adaptability of the pilot, not just the system itself. Here we seek to understand the processes that impart those skills and adaptability at scale.

Introduction

Drone warfare's share of the activity in the Russo-Ukrainian War is reaching new heights. Starting from near zero in 2022, Ukraine will produce seven million drones domestically in 2026. As high as 80% of casualties inflicted on the Russian invaders trace back to effective drone deployment (Hartog, 2026). In light of President Volodymyr Zelenskyy's publicly stated goal of inflicting 50,000 casualties on Russia per month, surging unmanned system production will be an essential pathway to victory. Coinciding with aggressive procurement policies, Zelenskyy further outlined that it is 'the experience of our most effective drone units' that 'must be scaled across all the forces of our state' (Office of the President of Ukraine, 2026).

Meanwhile, in the rest of Europe, the advent of drone warfare and its commensurate implications has finally driven initially sceptical governments and perhaps path-dependent, prime-dominated industry to invest in and produce unmanned systems (UxS) for their armed forces. Such topline figures have rightly steered debate relating to the longer-term effectiveness of drones and their role in NATO armed forces. Procurement alone, however, is a half-measure.

Uptake of these emerging systems demands a shift in training and a reconsideration of the constellation of participating actors – and their interrelationship – in unmanned systems training (UST). Legacy weapons platforms and systems – tanks, armoured vehicles, artillery – require extended development periods and enjoy long terms of service and efficacy. By contrast, UxS produced today will in six months be vulnerable to emerging electronic warfare (EW) and countermeasures (C-UAS) which continue to develop at pace with battlefield developments in Ukraine. The focus on exquisite, highly complex and expensive weapon systems represents a mixture of peacetime mentality and path dependency. Unmanned systems are simple, cheap, highly modular platforms with an increasing number and wide variety of use-cases. Nevertheless, what has remained

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chronically under-researched is the manning of unmanned systems.¹ In the intervening four years of full-scale war, press coverage and scholarship alike have rightly dedicated significant attention to Ukraine's use of drones. Simultaneously, Ukraine has trained tens of thousands of UxS operators via a whole-of-society approach, combining the ingenuity of civil-society, industry, and the armed forces (Barysheva, Buhai and Istomina, 2026, p. 10). For matters of unmanned systems training, Ukrainians are compelled by circumstance to ask the right questions

and test early solutions to defeat a quantitatively superior adversary. But they are not alone. As indicated by thousands of drone training facilities as part of an endeavour to train 1.5 million drone operators by 2030, Russia's embrace of a 'whole-of-government/society approach' to UxS training underscores the urgency of 'manning' (DuPont, Vranian and Powers, 2026, p. 6). Europe cannot afford to concede this training advantage to Russia.

The nature of UxS training requires change. Traditional approaches to military training are linear processes that start with a weapon system and result in a static end user. Instead, UST starts with a user and teaches adaptability, focusing on how to harness technological capacity for effect in a constantly changing environment. Without live battlefield or training data, there is no fluid environment in which to train soldiers to be adaptable, and for manufacturers to solve. A training-industrial complex foresees generating the data

1 Recent policy reports encouraging increased investment in unmanned systems procurement tend to neglect the dimension of training, favouring instead discussions of doctrine and industrial cooperation. See McCusker, Kagan and Sims (2025).

needed to maintain a technological edge on the enemy while training operators how to leverage this technology for advantage on the battlefield. Towards this end, we argue the proactive integration of manufacturers into unmanned systems training is essential to consolidate feedback loops between soldiers and product experts. This represents the ideal procedure with varying levels of implementation. The ultimate output of a training industrial complex should not merely be effective systems, but above all, adaptive soldiers.

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To respond to Europe’s security challenges, we characterise Ukraine’s systemisation of feedback loops into their training and manufacturing ecosystem as an emergent ‘training industrial complex’, and highlight the urgent need for such a system in NATO. No single actor (the armed forces, manufacturers, or civil-society) can produce a ‘drone ecosystem’ alone (Matlack, Schwartz and Gill, 2025); a whole-of-society approach is needed.

Ukrainian military experts contended that

80% of a given UxS mission’s success ultimately is owed to skill of the pilot, not solely the efficacy of the system itself. By extension, the quality of UxS pilots relies heavily on the investment and dedication of training centres.² Defence ministries and armed forces form the logical core of this constellation. Owing to the dual-use character of unmanned systems (UxS), civil-society actors interested in wide-spread adoption of UxS training play an essential role. The United Kingdom’s Strategic Defence Review (2025) identifies civil-military exchange as a core effort (Ministry of Defence, 2025). Manufacturers, in turn, not only fulfil the role of equipping forces, but they also benefit from the actionable data collected during field

2 Interview with INDIA.

training. Lastly, allied forces, participating in multinational training exercises, serve to inject external experience and outside industrial expertise, rounding out this collective.

Unmanned systems training at its finest represents the single access point where all stakeholders exchange. Only government can both provide the structures to unite all necessary parties; we argue that it is imperative European and NATO armed forces build an integrative, scalable, and streamlined training industrial complex to prepare European militaries for a return to full-scale inter-state war, delivered in line with the pace of modern technological advances.

In the first section, based on field research results, we introduce Ukraine's own native UST capabilities. This foreground is essential; only two countries in the world implement UST at scale. Composed of a diverse and decentralised network of actors, we examine how the Armed Forces of Ukraine (AFU), in partnership with civil-society, and manufacturers (both foreign and domestic) assemble to deliver UST in wartime. After synthesising this context, in the second section we distil what essential qualities – with their implications on policy – are needed for UST in NATO countries. Most critically of all, by outlining the ingenuity of Ukraine's UST, we identify targeted measures to surge financial aid to these structures to better support Ukrainian soldiers in the immediate term.

In our conclusion, we submit two policy recommendations:

- Reconfigure the armed forces' interrelationship to external actors to maximise for whole-of-society approach to training and feedback loops.
- Manage training data to develop soldiers and systems in tandem.

Regarding methodology, there are a few critical aspects to consider. In this essay, we refrain from all direct attributions,

both personal and organisational. Out of consideration for the sensitivity of the subject matter, ours is an argument drawn from background research, sourced by publicly available items. Delivering an empirically grounded report on Ukraine’s UST is an ongoing endeavour. All interviews were held exclusively by the authors on-site in Ukraine in Q3 2025.

Unmanned Systems Training in Ukraine: An overview

Military

The primary group delivering and receiving UST is the Armed Forces of Ukraine. Resolution No. 1129 of the Cabinet of Ministers of Ukraine on 01 October 2024 standardised the certification of schools delivering UST (Cabinet of Ministers, 2024). Associated government parties with a declared interest in this process are wide ranging including: the MOD, Ministry for Digital Transformation, General Staff of the AFU, Security Services, Ministry of Internal Affairs, National Police, National Guard, State Border Service Administration, and State Emergency Service. We subsume all government actors under the rubric of ‘military’ for brevity. In practice, UST spans the entire state apparatus.

Figure 1. Ukrainian Unmanned Systems Training Actors



Certain polygon arenas operated by both the AFU and NGOs are accessible to civilians as part of dual-use training courses. For initial first-person view (FPV) courses, non-descript industrial buildings suffice to host obstacle courses for flight path training. This is to say, what's most important for UST with regards to space is the ability for soldiers to experiment and hone their skills.

Within the military, the Unmanned Systems Forces Command (USFC) and the Ground Forces (GF) are the primary training actors. The Ground Forces integrated unmanned aerial vehicles (UAVs) into Basic Training to familiarise them with battlefield use cases of UAVs. GOLF's AFU training centre is directly under the Ukrainian MoD's supervisory purview and is subordinated to the General Staff (Armed Forces of Ukraine, 2025).

Soldiers entering the AFU undergo 51 days of Basic General Military Training (BGMT). According to AFU Commander-in-Chief General Oleksandr Syrskyi, extra days were added in October 2025 to introduce service members to countering enemy unmanned aircraft systems (UAS) (Armed Forces of Ukraine, 2025). Throughout the course of the war, BGMT's term has been lengthened to continuously address battlefield realities, with soldiers being drilled in unit-level operations for 209 hours, including survivability against unmanned systems. As a recent study performed by Come Back Alive illustrates, it's important to stipulate that 'the quality of training depends not so much on the content of the programme, but on the complexity of its current implementation at training centres' (Bahlai, Moskalenko and Muraveinyk, 2025, p. 8). It should also be noted there are frequent criticisms on the length and quality of BGMT, with regular calls to extend the course and reform it to stay relevant to the developing nature of drone warfare. Coinciding with legitimate critiques of Ukraine's BGMT, as of March 2026, the Main Directorate for Doctrine and Training of the AFU General Staff announced a cessation of sending Ukrainian recruits to train abroad with partner nations. Partners' lack of experience with modern warfare is cited as a leading rationale (Defence Tech Monthly, 2026, p. 10).

Training UxS operators requires consideration of which systems soldiers are to train on, and subsequently, invites participation from a multitude of external system instructors from manufacturers. There are 2,000+ private manufacturers and software companies currently, or endeavouring, to supply the AFU,³ with at least 200 different unmanned platforms on the battlefield (Bondar, 2025). Instructors at GOLF's training centre, for example, are instrumental to distilling the enormity of this market into key competences for training. After completing BGMT, soldiers selected for UAS operations proceed to centres like GOLF's. This centre is tasked with first contact ('zero hours') training for prospective pilots, with soldiers being exposed to the varying systems of quadcopters, and Intelligence, Surveillance and Reconnaissance (ISR) over five weeks of training.⁴ Staff deliver training at this centre as military instructors, with manufacturer and NGO instructors augmenting their curriculum coverage on a rotating basis.⁵ 30% of the curriculum is discretionary to individual military instructors, and 70% codified by the General Staff.⁶ During their time here, soldiers specialise in particular unmanned systems platforms. At this stage, private instructors from manufacturers join on-site to deliver platform-specific training, or, alternatively, soldiers proceed to specialise in specific systems at subsequent centres.

Once considered a low-prestige position in the armed forces, highly effective soldiers/veterans are tapped by AFU training units to inject their experience into training.⁷ In turn, instructors are required to maintain their role in battlefield feedback loops to keep up-to-date with tactical developments, changes in tactics, the current state of Russian countermeasures, and the efficacy of emerging UAS, also being instructed to practice with other experienced operators for

3 Interview with NOVEMBER.

4 Interview with GOLF.

5 Interviews with GOLF and ROMEO. The former stated 70, the latter stated 80.

6 Interview with DELTA and CHARLIE.

7 Interview with CHARLIE and DELTA.

two-three days per month.⁸ These instructors are the lifeblood of the military's UST.

Brigades and unit training represent a further core component of the AFU's UST. The 3rd Army Corps and the 1st Azov Corps in the National Guard of Ukraine were specifically identified as national leaders in UST and commensurately were interviewed by the authors. It is worth noting that both entities have formed informal working groups with one another, in partnership with other leading fighting brigades.

The 3rd Army Corps is one of the AFU's most effective frontline fighting forces with a reputation for excellence in fielding unmanned systems, while also pioneering its own codified contribution to Ukraine's Unmanned Systems innovation and training. The Corps operates a multi-location unmanned systems training school called 'Killhouse Academy' (Killhouse, no date). At the 3rd Corps' own schools, individuals can specialise in FPVs, ISR, but also drone engineering, countermeasures, electronic warfare, with newer offerings additionally focused on Unmanned Ground Vehicles (UGVs). The terms of courses vary with modular content scaled to specialise trainees in particular directions.

The 1st Azov Corps offers its own proprietary specialised training in unmanned systems. Unlike the 3rd Army Corps, Azov conducts its training with less public exposure. At the time of writing, we understand that after completing BGMT and training at AFU centres, prospective soldiers for Azov undergo three to four weeks of tailored unmanned systems training depending on the selection system, be it FPV, ISR, or deep strike. These courses are customised and regularly updated every cycle by commanders.

8 Interview with GOLF.



RQ-20 Puma in Ukrainian 148th Artillery Brigade, 13 May 2024. Photo: ArmyInform

Civilian

NGOs and commercial enterprises fill a gap in the military's training capacity. NGOs dominate this space with 30+ entities that deliver UST to the armed forces.⁹ Prior to 2022, UST did not exist in any cohesive form. Volunteer unmanned systems units were first movers in establishing baseline standards and needs with AFU units for a framework of UST; second, the pace of upscaling the AFU in the wake of the full-scale invasion considerably overextended the military's ability to train. With an abundance of volunteer units, UAS expertise is fluidly dispersed between civilian and military actors, motivating grassroots activation of NGOs to respond to highly specific battlefield and training needs. Often these civilian organisations delve deeper into niche topics, such as unmanned systems and medical training, or focus primarily on technologies or tactics.¹⁰ NGOs owe their success to the 'extraordinary personal commitment' of the Ukrainian people to training themselves as citizens, and their soldiers as defenders (Bilousova, Olkhovik and Risinger, 2025).

⁹ Interview with ROMEO.

¹⁰ Interviews with TANGO and ALPHA.

Today, there is now an established MoD certification process for NGOs seeking to deliver UST. Schools passing this process are permitted to grant course participants with a certificate that entitles the individual to obtain Military Occupational Specialty (MOS) No. 216 'UAV External Crew Members'.¹¹ This status is regularly reviewed, with training targets set monthly. Furthermore, this framework foresees adherence to state quality standards for training, ensuring that all graduates meet the military's baseline requirements.

Beyond that process, the MoD additionally offers a distinct pathway for NGO's to attain a so-called 'critical status' for the Defence Forces. Both ROMEO's and DELTA's NGOs, for example, underwent this process. NGOs operating under this umbrella are required to liaise directly with the General Staff, as well as with brigade commanders, to sign Memorandums of Understanding. In this way, the MoD confers a chief advantage to NGOs attaining 'critical status' by granting exemptions to UAS instructors and staff from mobilisation. Exemption status is not granted lightly and bears with it an institutionalised responsibility. To maintain a given number of exempted staff, NGOs are obliged to train a certain number of service members for the armed forces based on their training in UAS, UGVs, or Electronic Warfare.¹²

A combined selection of three of the major NGOs delivering UST for the Ukrainian Armed Forces have trained over 250,000+ personnel over a wide range of skills (FPV, Engineering, Mission Planning, Countermeasures, Deep Strike, UGVs, Navigation, and many more) since 2022.¹³

11 Interview with DELTA. Other Military Occupational Specialties related to unmanned systems are review by the Ministry of Defence of Ukraine Order No. 47 (MoD, 2025).

12 Interview with CHARLIE.

13 Interviews with SIERRA, DELTA, and CHARLIE.

With this ever-expanding pool of civilian expertise, commercial enterprises offering unmanned systems training as a service are gaining traction, like ALPHA's company and private for-profit schools catering to civilians. Beyond selling unmanned systems as hardware, ALPHA's company and other smaller entities are beginning to market the training experience itself as a realistic commodity.¹⁴

Manufacturer

Among the three major stakeholders in Ukraine's UST, manufacturers cross-pollinate the most effectively. Most if not all of the well performing manufacturers of unmanned systems provide proprietary training on their platforms to the AFU, often included in the cost of the platforms themselves, at least initially (Samus, 2024, p. 5).¹⁵ Foreign manufacturers are driven by the same forces as Ukrainian domestic manufacturers; the success of their systems is entirely contingent upon streamlined execution by its operator. A common estimate pervading our interviews was that up to 80% of a mission's success lay not in the technical superiority of the product but in the personal skill of the pilot.¹⁶ Complicating this goal, average recruits have low technical vocational skills, so the skill gap is a major concern of manufacturers.

*Soldiers are ultimately less invested in the use of and success of a given system, whereas companies are highly invested in quality assurance and the future of the product. Good training is the primary way to assure the efficacy and thus quality of a product.*¹⁷

14 Interviews with INDIA, ALPHA, and NOVEMBER.

15 Additional confirmed via interviews with INDIA and JULIETT.

16 Interview with INDIA.

17 Interview with INDIA.

The major influence of manufacturers was to inject a degree of standardisation in system certifications. In the early days of Ukraine's UST, only manufacturers and their representatives were equipped to narrowly define what constituted a passable certification. The AFU training centres on NGOs – their courses ultimately must interlock with manufacturer specifications on system needs.¹⁸

JULIETT's company, a top five foreign manufacturer, granted us exclusive access. We interviewed senior Ukrainian and domestic representatives of the company and visited one of its production facilities. Their ISR training for four pilots costs approximately €30,000, with equipment costs of around €100,000 for three months of training and one year of operations. Illustrating another angle of the centrality of training, at this company, all employees working in Ukraine – regardless of their area of expertise – are required to undergo the mandatory five weeks of training. The underlying logic is as follows: by intermixing with military recruits at AFU training centres, new employees gain insight into the actual end users of their product and their needs.

INDIA's company relies upon the centres facilitated by the AFU, as opposed to a centralised, in-house approach. The AFU's UST is both the first entry point for military personnel and manufacturer employees. Instructors carry out their training directly on the grounds of the AFU's UST and, like NGO instructors, they occasionally accompany units to the frontline for 'testing'. The best companies operate a 24/7 customer call centre, often providing real time support and advice to combat operations, but also classifying each request or problem and feeding this information immediately back into their design, production, or training teams as appropriate; this is after the initial triage and analysis, following the software/design formula of 'problem, solution, check' in a constant, iterative process.

18 Interview with GOLF; interview with JULIETT.

When asked at what stage unmanned systems manufacturers should implement proprietary training integrated into the Ukrainian UST system, the unequivocal answer was ‘the earlier, the better’.¹⁹ Companies which do this too late or not at all regularly fail because the products are not able to be tested, corrected, or piloted properly.

There is also significant cooperation between Brigade-level UST, NGOs, and prospective manufacturers. As SIERRA put it: “Send us your anti-shaheed solutions, we can test it at our training facilities, giving you an audience spanning the entire AFU. And then our instructors will take it straight to the frontline.”²⁰ In this way, NGOs and Brigades are aware of their central role in guiding both the entry of new manufacturers into the system, but also in matchmaking the battlefield use cases from frontline units to the exact companies pitching their kit. Units like Azov have dedicated matchmaking with foreign and domestic manufacturers to sort them with the precise unit needed for a given battlefield use case; Azov.1 is the legal entity that manages this process.²¹ Other corps, brigades, and their affiliated organisations informally operate such matchmaking services.

As cultivating Small and Medium-sized Enterprises (SMEs) is a national priority, rapidly demonstrating operational impact is mission critical for SMEs seeking to entice investment. All these actors will emphasise to prospective manufactures the core tenant embodied by JULIETT’s company: that positive training outcomes directly correlate to the operational excellence of an emerging system.

19 Interview with INDIA.

20 Interview with SIERRA.

21 <https://azov.one/en>.

The Soldiers

Finally, it's worth reflecting on how individual Ukrainian soldiers interact with and experience these fluid structures. For starters, there is no standardised, singular pathway towards becoming a drone pilot. Anticipating military service, either via conscription or volunteering, individuals frequently partake in publicly available UST courses offered by NGOs and military organisations. Seen as a proactive measure, an individual's initial familiarity with UxS therefore is often facilitated by civilian structures. In any case, once beginning BGMT within the AFU, recruits are imparted with exposure to one-way attack drones, ISR, and C-UAS. This step entails a recruit's first familiarisation with a manufacturer's kit with a company trainer. After BGMT is completed, soldiers proceed to their own units, where multiple weeks of more specialised training instructs on the finer tactical applications of UxS, operations, command and control, and unit protocols. Yet the journey continues. The final stage anticipates soldiers shadowing frontline drone teams to fully round out a pilot's awareness. UNIFORM, charged with leading such efforts, regards this as the most critical stage of training.

For each training step, an instructor is needed. NGOs, manufacturers, and the armed forces all compete for, and invest in, the capabilities of a vast pool of instructors to keep pace. For this reason, we speak of a training industrial complex and not merely of a training programme. Ukraine's decentralised, whole-of-society approach to UST ensures that a twinned ecosystem of trainers, manufacturers, and NGOs can train pilots, produce systems, and keep both these pilots and platforms up to date with the rapid pace of battlefield developments.

Topline Recommendations for a Training Industrial Complex for NATO Europe

Ukraine's allies are still in the privileged position to act and translate Ukraine's warfighting experience into their own national contexts. Solving the bottleneck of recruitment and training of personnel will be foundational to war preparedness. As Olena Kryzhanivksa states: "Governments may provide their forces with thousands of advanced drones, but without trained personnel to operate them, the equipment becomes useless" (Ukraine's Arms Monitor, 2025). Towards this end, this concluding section submits two recommendations to European policy makers, defence manufacturers, and civil-society actors that need consideration when developing their own training industrial complexes. Our emphasis is not on directly replicating Ukraine's approach to UST, but instead to identify two top-line qualities that a training industrial complex cannot exist without. Those being:

1. Reconfigure the armed forces' interrelationship to external actors to maximise for whole-of-society approach to training and feedback loops.
2. Manage training data to develop soldiers and systems in tandem.

Recommendation One: Whole-of-society training

First, the armed forces must act as a convener to engage industry, government, and civil society as the principle coordinator. This entails establishing horizontal, and not merely vertical, communication channels with external partners. Rank-and-file soldiers and recruits at the battalion-level should be granted access to limited propriety funds to procure unmanned systems for experimentation (Sausser, 2025, p. 61). Inculcating market savvy is an asset. The ability to procure and test varying systems not

only produces better trained personnel but invites soldiers into the developmental feedback loops themselves. Exposure to a plethora of systems similarly encourages a 'teach a person to fish' rather than 'giving them a fish' mentality (Matthew 4:19).

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Training for adaptability cuts both ways. By opening channels between soldiers and manufacturers, partners in industry will be challenged to provide their services at scale. In a wartime posture, manufacturers' support for capabilities needs to be able to cope with immediate, all-hours feedback from frontline combatants. Stress-testing military-industrial relationships in training is essential to avoiding critical failures and lethal waiting times in a wartime scenario. In this way, bureaucratic hurdles for manufacturers to engage with individual units should be minimised to ensure that feedback loops are not needlessly siloed, while also managing and tracking these engagements for security purposes.

As others have observed, the Ukrainian case demonstrates that such industrial-military partnerships stimulate dual-use sectors by increasing the collective pool of technical expertise across the workforce and armed forces (Berthelsen and Hartmann, 2026, p. 4). Success, in this regard, is to produce system-agnostic fighting forces that can seamlessly adapt to the most innovative UxS technologies emerging.

Reforming the civil-military relationship to dramatically increase engagement is equally important. In lieu of the urgency of an active frontline, it is unreasonable to expect that European civil society will engage with the armed forces in the same way as in Ukraine. They

will need a push. Utilising the platform of unmanned systems training provides an echelon of engagement between the armed forces and the public for dual-use courses. Guided by veterans and military personnel, drone training courses afford civilians the opportunity to qualify for certifications and test their skills for recreation. In an age where recruitment and conscription are central topics, civil-military training augments efforts to introduce UxS to prospective civilian recruits. Furthermore, as Ukrainian society can testify, civilians regularly face threats from one-way attack FPVs and Shahed/Geran-2 drones. Understanding of these systems is essential to protecting civilian populations (Enneker Forum Tegernsee, 2025). Recent events seeing civilians seeking shelter in the Gulf States because of the US/Israeli war against Iran demonstrate the urgency.

Furthermore, the government should enable ease of access to UST by allied partners. As previously argued, Ukraine was forced by circumstance to dually develop both a pool of trainees and instructors simultaneously. Given Ukraine's recent endeavours in training allied personnel, Ukrainian experts can fulfil the role of training the instructors to rapidly accelerate knowledge transfer (Freer, 2025, p. 23). As the 2025 'Hedgehog' exercises in Estonia demonstrated, red teaming with allied partners exposes weaknesses and grants the opportunity for honest exchange and improvement (Oliviero and Halton, 2026).

Recommendation Two: Training Data as priority

The supremacy of data cannot be overstated. In the UK's Strategic Defence Review (2025, p. 2), reference is made to a 'defence dividend' as a by-product of rearmament. Currently, most of the leading UxS manufacturers are already offering battlefield products in Ukraine. Maintaining feedback loops and combat data streams serves to continuously update a manufacturer's understanding of their products and software. But Ukraine's frontline cannot cover all use cases to account for varying topography and correlation of forces.

In both cases, generation of combat-adjacent data from unmanned systems training will serve as the lifeblood for manufacturers seeking to innovate in peacetime. If the training of Large-Language-Models has taught us anything, it is the essential value of massing data for improving the efficacy of complex software systems. If a defence dividend is to extend into the future, the armed forces must be empowered to collaborate with industrial partners to

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With data sources from domestic manufacturers, NGOs, military training – and above all, the battlefield – the Armed Forces of Ukraine represents Europe's best partner for distilling data into actionable results for unmanned systems training.

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generate these data streams. The Ukrainian government platform Brave1, for instance, recently launched a 'Dataroom' that aggregates datasets for training AI across the air-defence cycles to support domestic industries (Defence Tech Monthly, 2026, p. 13). The by-product of these efforts will be to produce more effective, and thereby commercially competitive and battlefield-ready systems.

Access to training data will be paramount. As a recent study by Tamar Jacoby (2026, p. 25) illustrates, joint ventures with Ukrainian defence companies necessitate deliberate and persistent efforts to trudge through bureaucratic hurdles on both sides of the Ukrainian border; companies predominantly from Germany, the US, and Denmark have already achieved durable partnerships in the private

sector. Governments must soon follow, and for the same reason. With data sources from domestic manufacturers, NGOs, military training – and above all, the battlefield – the Armed Forces of Ukraine represents Europe's best partner for distilling data into actionable results for unmanned systems training.

Conclusion

Ukraine has already found its first mover. On the fourth anniversary of the full-scale invasion, Ukraine and Denmark’s defence ministers – Mykhailo Fedorov and Troels Lund Poulsen – announced a 33 million EUR investment into an AFU training infrastructure. Come Back Alive, a Ukrainian NGO, is charged with oversight for implementing this initiative (Ministry of Defence of Ukraine, 2026). Considering the broader context, this investment represents a fraction of Denmark’s cumulative aid to Ukraine since 2022, yet stands to position Denmark as a leading ally and primary partner for the exchange of lessons learned and technology transfer (Ministry of Foreign Affairs of Denmark, 2026).

The surest short-term strategy for government and industry to develop a training industrial complex for unmanned systems is to invest into Ukraine’s existing capabilities. Safeguarding Ukraine’s expert-class instructors, pilots, and soldiers by significant investment into UST will yield the most valuable resource currently available: time. By relying upon Ukrainian instructors, European allies will be positioned to expeditiously accelerate the following steps. Without adequate depth in training capacity, any European effort to keep pace with Russia will falter at the starting line. To paraphrase ALPHA: “If a problem can be solved with funding, then there is no problem, there are only expenses.”²² ■

22 Interview with ALPHA.

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Annexe 1

Table 1: Overview of interviewees during field research in July 2025 in Ukraine.

Interview Subject	Role & Organisation	Categorisation
ALPHA	CEO Private UxS Training Company	Civilian (Commercial)
BETA	CEO at UxS Manufacturer	Manufacturer (Foreign)
CHARLIE	Co-Founder UxS training NGO	Civilian (NGO)
DELTA	Co-Founder UxS training NGO	Civilian (NGO)
ECHO	Representative UxS Manufacturer	Manufacturer (Foreign)
FOXTROT	Officer General Staff AFU	Military (AFU)
GOLF	Instructor, AFU Training Centre	Military (AFU)
HOTEL	UxS investor	Civilian (Commercial)
INDIA	Head Instructor at UxS manufacturer	Manufacturer (Foreign)
JULIETT	Head of Production at UxS manufacturer	Manufacturer (Foreign)
MIKE	Co-Founder UxS Manufacturer	Manufacturer (Foreign / Domestic)
NOVEMBER	Co-Founder UxS Manufacturer	Manufacturer (Foreign / Domestic)
PAPA	Senior officer, Unmanned Systems Forces	Military (AFU)
ROMEO	Co-Founder UxS training NGO	Civilian (NGO)
SIERRA	Senior Advisor UxS training NGO	Civilian (NGO)
TANGO	Head of Medical Training Unit for AFU Medics	Civilian (NGO)

Annexe 2

Key Acronyms

AFU – Armed Forces of Ukraine

BGMT – Basic General Military Training

FPV – First-Person View

ISR – Intelligence, Surveillance and Reconnaissance

SME – Small and Medium-sized Enterprise

UAS – Unmanned Aircraft System

UAV – Unmanned Aerial Vehicle

UGV – Unmanned Ground Vehicle

UST – Unmanned Systems Training

UxS – Unmanned Systems



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