When Drones Change the Face of War

Published on 29/11/2025

In the past two years, the **war in Ukraine** has clearly shown that the future of combat is no longer what we studied in manuals. The **tanks, trenches, "secure" logistical columns** — everything that was thought of as the foundation of defense — is becoming vulnerable to a new paradigm: that of **unmanned aerial systems (UAVs)** and, above all, drone warfare.

The traditional, rigid, and static front has been erased. As an officer of the **110th Separate Mechanized Brigade of Ukraine** explained in a recent interview: *"the trenches have started to disappear; drones have erased the front line and created a wider death-zone"*.

This means that being detected often equates to being doomed.

Counterattack is no longer just a matter of brute force: **the ability to surveil, strike, interdict, and attrit via drone is redefining military superiority**.

A Ukrainian soldier in a trench near Bakhmut at the beginning of the conflict with Russia - Copyright Efrem Lukatsky/Ap

The paradox of anti-drone: extremely costly to defend against something that costs little

The situation is simple but disconcerting: **attack drones**, especially those mass-produced or relatively simply made, **cost little**, while **anti-drone countermeasures**, which theoretically should be “easy to implement,” often prove to be **complex, slow to develop, and very costly**.

Detection and mitigation technologies include **specialized radars**, **RF sensors**, **optical and acoustic sensors**, **jammers**, **GPS spoofing**, **lasers**, and **high-power microwave (HPM) systems**. It is therefore not surprising that the global **anti-drone (C-UAS) market** is estimated to grow significantly: according to a forecast, it could rise from **2.45 billion dollars in 2024** to **10.58 billion by 2030**.

The high cost does not only derive from the hardware but from the need to develop **integrated solutions** that combine **detection, classification, tracking, and mitigation**, supported by **advanced software**, **artificial intelligence algorithms**, and **command and control infrastructures**.

Thus, while a relatively simple drone may cost **a few thousand dollars**, an advanced anti-drone system can require **tens or hundreds of thousands of dollars** per platform.

In essence, we find ourselves in a context where the enemy **invests little** and forces us to **spend a lot**: if we cannot reverse this curve, **we risk losing even on the economic front**.

The British Defense's C-UAS DragonFire laser system, expected by 2027, stems from a directed energy weapons development program costing around 1 billion pounds – Copyright British Defense Ministry

The factors that drive up costs

1. **Modular sensors and platforms**: multi-sensor configurations (radar + optical + RF + acoustic) are expensive to develop, integrate, and maintain. Each new sensor adds weight, power, cooling, software.
2. **Countermeasure effectors**: advanced solutions like directed energy lasers, microwaves, electronic takeover require costly research, special components, rigorous environmental testing.
3. **Software, AI, and C2 integration**: it's not enough to “see” a drone, it must be classified, a response decided, and activated in real-time. Latency, system trust, resilience to attacks (e.g., spoofing or electronic warfare) represent significant costs.
4. **Scalability and mass production**: if the system is designed to face waves of drones, a few expensive systems are not enough: many distributed systems are needed, requiring industrialization.
5. **Upgrades and rapid obsolescence**: drones evolve quickly (smaller, quieter, stealth materials, mesh communications), and countermeasures must keep pace. This entails continuous upgrade costs.

Where costs could be significantly reduced

- **Focus on lightweight and targeted platforms**: a “mega-mammoth” system is not always necessary. For certain local threats or critical infrastructures, leaner, less expensive but effective modules may suffice.
- **Cooperation and sharing**: if more actors (governments, industry, research world) collaborated for common standards and modularity, unit costs would decrease.
- **Exploitation of emerging realities/SMEs**: often SMEs or spin-offs can develop agile, cost-effective solutions, quicker to adopt. Targeted funding for “small realities” could break the monopoly of large defense companies and reduce the overall cost of the anti-drone system.
- **Economy of scale and dual-use**: if sensors/effectors developed for the military also have civilian applications (critical infrastructures, events, airports), production volume increases and unit cost decreases.

American soldiers with a DroneShield C-UAS system, an Australian company founded in 2014 and now a leader in the dual-use sector, where technologies born for the civilian market directly contribute to the development of advanced military capabilities - Copyright DRONESHIELD LTD

Smart investments or elephant chase?

Today building and developing a new fighter, a new ship, or a cruise missile **does not cost a few tens of millions**: **they cost billions**. Large platforms — jets, warships, missile systems — require massive industrial infrastructures, long production cycles, global supply chains, and decades of design. And this is not a detail: it is the definition of the entry barrier to the “large defense industry.”

These companies, on one hand, have the **economic potential and critical mass**. But on the other, they have “too wide meshes”: too many internal divisions, too many decision-making levels, and thus an intrinsic slowness in innovation. **If yesterday they produced tanks and today they want to develop lightweight anti-drone systems**, they must redesign themselves — organize new teams, change mindset, overcome the rigid “large platform” logic. Very often they do not do it with the necessary speed.

As I often find myself saying in meetings and gatherings:

«The current logic involves the allocation of enormous funding – sometimes through contracts that are then internally redirected to research – which do not produce the results we want in terms of time or effectiveness. If half of that money (think of public funding for the development of a jet) were invested in small and agile companies, we could achieve rapid, effective development that, in the long run, would bring both military and economic advantage – because let's remember: anti-drone platforms will be necessary everywhere and to protect everyone.»

And this is where strategic thinking comes in: **funding small structured realities**. Not “two-three engineers in a garage,” but agile, industrial companies capable of moving quickly within their network, creating a dedicated team from scratch, producing and testing *ten functional platforms* in short times. Because in this scenario — **drone war + countermeasures** — the big ship is no longer needed, what is needed is the number, distribution, speed.

Traditional financing machines tend to either the large conglomerate group (which absorbs time and money), or the “dream” startup, which still depends on an industry to actually produce. The result? **High costs, long times, high technological risk**. Instead, if the strategy were thought out as it is structured in the Armed Forces — agile modules, selected units, rapid iteration, multiple prototypes — we could achieve effective, economical, and real-time distributed anti-drone solutions.

In summary: if we want anti-drone defense to become a **competitive advantage** and not just an additional cost, we need to change the logic of investments. Not “big ticket” for the platforms of the past: **smart funding for the platforms of the present-future**.

The HYDRA range from the French company CerbAir, founded in 2015 within the X–HEC ecosystem, the innovation hub that networks the scientific and engineering university École Polytechnique and the business school HEC Paris, represents a case of dual-use excellence: passive RF detection systems designed to protect both civilian infrastructures and military installations from the growing drone threat – Copyright CerbAir

In conclusion: let's wake up before it's too late

For decades it was thought that “serious” defense was made of **tanks, armored vehicles, fighters, submarines**. Today those paradigms are not in obsolescence: **they are vulnerable**. And not due to budget shortages or lack of will, but because tools and strategies built for another type of war continue to be applied.

When Ukraine became a “drone-first zone”, when **the “death zone” extended well beyond the trench**, the old doctrine was caught off guard. The problem is not only tactical or operational: **it is strategic and industrial.**

If we invest only in conventional armaments — without addressing the research of countermeasures — we are chasing the enemy with our hands tied. And, worse still, we end up favoring those who first understood that superiority will no longer depend solely on “hitting more”, but on “not getting hit”.

What needs to be done?

- **Revise the doctrine:** consider anti-aircraft and anti-drone defense as a primary component, not an additional one.
- **Invest in research:** not just buying what exists, but developing what is needed. In particular, focus on smarter and less expensive algorithms and sensors.

- **Support SMEs and startups**: reward those who think of quick, light, modular solutions.
- **Create interoperability and industrial efficiency**: an anti-drone system designed in isolation will always be more expensive and slower.
- **Anticipate the threat:** understand that drones are no longer a “potential” but a “here and now”. Ignoring them is not an option.

If we remain spectators, we risk letting the enemy decide the rules of the game. In practice, we will find ourselves with thick, expensive, and inadequate armaments to face large waves of “simple” but effective systems.

In this context, those who manage to develop — and implement — an **effective and economical anti-drone ecosystem** will have true superiority in the next phase of the global conflict.

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