

**INTELLIGENCE BRIEF**

# **Fibre Optic Drones in Ukraine:**

## **Disrupting the Electronic Warfare Paradigm**

### **Key Points**

- Fibre optic drones are a new technological innovation on the Ukrainian battlefield, offering resilience against electronic warfare by bypassing radio frequencies.
- Russia has taken a lead in deploying these drones, enhancing their reconnaissance and target acquisition capabilities, especially in EW-dense environments.
- Ukraine is catching up with domestic production but remains at a tactical disadvantage in this field.
- The drones' ability to operate at low altitudes and even indoors complicates force protection and significantly hampers troop rotation and mobility.
- The future battlefield will likely see widespread adoption of tethered drones, prompting new countermeasures and reshaping the dynamics of drone warfare.

**Event Summary:**

**What:** The use of fibre optic drones, which transmit control and video signals through a physical fibre optic cable rather than radio frequencies, has emerged as a critical innovation in the ongoing Russia-Ukraine war. These drones are largely immune to traditional electronic warfare (EW) jamming techniques.

**When:** This technology began making a marked impact from autumn 2024, with increased visibility and deployment in early 2025.

**Who:** Russian forces have led the implementation of fibre optic drones. Ukraine's military—particularly the 68th Jaeger and 5th Assault Brigades—have begun deploying them more recently and in limited numbers.

**Where:** The deployment has been concentrated along the heavily contested eastern and northeastern fronts of Ukraine, including near the Kursk oblast, where Russia reportedly used them during partial reconquest operations.

**How:** These drones are equipped with long spools of fibre optic cable (up to 20 km), which directly link the drone to its pilot. This direct physical link makes them immune to electromagnetic interference, a crucial advantage in EW-heavy environments.

## Analysis

Fibre optic drones represent a significant leap in drone warfare, primarily because they circumvent a major vulnerability of earlier UAVs: susceptibility to EW. Both Ukrainian and Russian forces have used extensive EW to jam and intercept radio-controlled drones. The introduction of tethered drones that operate below conventional radar thresholds and transmit data through cables nullifies many EW systems, especially those optimised for RF spectrum denial.

Russia's early adoption has given it a tactical advantage in reconnaissance and strike coordination. These drones can enter structures and fly at very low altitudes, allowing Russian forces to perform close-in surveillance with a high degree of stealth and precision. The drones' capacity to remain undetectable while transmitting real-time high-resolution footage improves artillery targeting and infantry coordination.

From the Ukrainian perspective, while innovation and adaptability have characterised much of their drone operations since 2022, the slow uptake of fibre optic technology has imposed a cost. Ukrainian forces have experienced significant increases in risks during rotation and supply movements. Infantry units report staying in trenches for extended periods—ranging from 30 up to 120 days in some cases—due to fears of exposure from undetected aerial surveillance.

Operationally, these drones present both opportunities and constraints. While they offer unparalleled resistance to jamming and secure data transfer, they are limited by speed and physical constraints—tether cables can get caught in vegetation or urban obstacles. However, their ability to operate in complex terrain (e.g., entering buildings) adds new layers of capability previously restricted to ground reconnaissance.

This development signals a shift toward a new generation of drone warfare, where resilience against EW will be paramount. It is likely that both sides will increase their deployment of such systems, potentially integrating them with loitering munitions or robotic ground platforms for layered ISR (Intelligence, Surveillance, Reconnaissance) and strike capabilities.

## Forecast

Given current trends and past innovations in the Ukraine war, it is likely that fibre optic drones will:

1. Proliferate rapidly: Ukraine is already scaling domestic production. A short-term gap in deployment may persist, but parity could be achieved by mid-to-late 2025.
2. Drive EW system redesign: Nations observing this conflict will likely invest in countermeasures to fibre optic drones—possibly through optical disruption, cable-cutting mechanisms, or hybrid EW-kinetic responses.
3. Influence NATO doctrines: The operational success of these drones may push NATO and other Western militaries to reconsider their own EW strategies and drone resilience protocols.
4. Shape urban combat tactics: Given their ability to navigate tight indoor spaces, these drones may reshape urban warfare, with implications for building clearance operations and anti-personnel targeting.



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