

Learning without bleeding

China's lessons from Russia-Ukraine drone war



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ANALYSIS

At a People's Liberation Army (PLA) center that runs trials pitting drone swarms against counter-drone defenses, one participant explained the logic to state media: "The errors we make in trials are detours the troops will not have to take." China is running the most systematic effort by any outside power to convert the Ukraine war's lessons into military advantage, absorbing the errors of both sides. Chinese analysts are explicit about the value of Russia's war against Ukraine. They describe the conflict as a living textbook and call 2024 "year one of world drone war," when the two sides fielded enough drones to show the contours of the new mechanized battlefield.

Examination of how this learning works finds three things:

1. Chinese analysts pick up new battlefield techniques within an average of four months, but turning them into hardware, training, and force structure takes a year or more.
2. The learning is distributed, with each defense industrial system feeding lessons into its own requirements and procurement channels.
3. China studies the war mainly from the perspective of the target. The deepest work comes from the designers of its air and harbor defenses, who treat Ukraine's sea drones and airfield raids as previews of attacks on China. The database for this analysis consists of more than 90 verified Chinese-language sources published between July 2022 and August 2026 across 45 outlets, including the Central Military Commission's newspaper and peer-reviewed journals of China's missile, shipbuilding, and aviation conglomerates. The database tracks two bodies of evidence: the literature itself and the implementation record that measures the speed of China's learning. The authors of the papers analyzed here are participants in the military learning system. They include researchers at the PLA's universities and academies, engineers at the defense industri-



SWAT officers are using drones to conduct reconnaissance during a tactical drill in a mountain forest in Liuzhou, Guangxi Province, China, on March 26, 2024.

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al design institutes, civilian academics working alongside numbered military units, and military acquisition organizations that turn battlefield lessons into requirements and procurement. As shown in Figure 1, for five signature techniques of the drone war, this analysis records three milestones: first battlefield appearance, first Chinese analysis, and first evidence of PLA training or hardware manufacturing. The intervals show a consistent pattern. Chinese analysts register new battlefield techniques quickly, with average of four months from front line to print. Absorption takes longer: organizational and system-level lessons surface only after a year or more of internal digestion.

Figure 2 maps each outlet to its sponsoring institution: the learning effort feeds directly into military requirements and procurement channels. Nearly half of the sources appear in

venues run by the defense industrial institutions — shipbuilding institutes that study naval countermeasures, missile academies that track strike and air-defense lessons, the aviation conglomerate whose own unmanned systems journal is the single deepest analytical platform, and the ordnance ecosystem serving the ground forces. China's study of the drone war runs through distributed channels. Each military structure feeds lessons from its journals through its design institutes and into its own service's requirements, while the Central Military Commission's press carries the doctrinal debate and state media broadcasts the conclusions.

This analysis sorts the lessons the way China does — offense, defense, organization, industry, and what the war failed to prove — because each category moves through a different channel at a different speed. Offensive technique is copied from Russia, whose army resembles the PLA's and whose fixes have been tested in combat. Defensive requirements are derived from Ukraine's attacks and built into hardware. Organizational conclusions are debated in the military press



Every missile the defender fires costs more than the drone cost the attacker, so the conclusion in the Chinese press is that the best weapon against a drone is another drone. Chinese analysts draw a second conclusion from the same numbers: any enemy China fights will have cheap drones in mass, so China must learn to shoot them down.

while institutions change around the debate. Industrial lessons flow into a manufacturing base that already leads the world, and unproven concepts stay open as a research agenda rather than purchases.

Lessons in offense

The first offensive lesson is economic. In March 2025, the PLA Daily treated as settled fact the claim that a single reconnaissance-strike drone costs less than one percent of a modern fighter while achieving more than 90 percent of its battlefield coverage. While these are rough figures, the Central Military Commission's newspaper states them without qualification. The professional literature provides supporting evidence. More than one million small drones were purchased by Ukraine and Russia in 2024 alone, which a Chinese naval academy analyst depicted as an average of two drones hanging over every frontline soldier's head. For Chinese planners, mass is not an ad hoc wartime improvisation but the economic structure of drone war itself. The second lesson is speed. According to the National Defense University's Joint Operations College, Russian forces can strike a detected target within three to five minutes — compared to hours in earlier wars. A survey by researchers at a PLA unit attributes this to Russia's reconnaissance-strike complex, in which a low-cost reconnaissance drone pushed deep into the enemy rear serves as the observer and guides another drone's strike, with Orlan-10s cueing Kub and Lancet loitering munitions. The copying target is not any single platform but rather the connection between them: drones wired directly into artillery and command networks.

The third lesson is overcommunication and connectivity. Chinese analysts treat electronic warfare as the deciding factor of the drone war, recording heavy losses on both sides to jamming and countermeasures. They registered Russia's answer — the fiber-optic first-person-view (FPV) drone steered through a thin cable that jamming cannot touch — almost immediately. The PLA Daily flagged the shift in May 2024 within weeks of the technique's operational debut, and by April 2025, state media were weighing its trade-offs in detail. That April, China Central Television (CCTV) showed a People's Armed Police unit in Yunnan training with FPV drones and researching fiber-optic models. PLA training footage of strikes and evasion released in 2024 was framed by Chinese outlets as drawing on Russia-Ukraine battlefield experience, down to the use of capture nets and jamming guns. About a year separated first battlefield use in Russia from Chinese unit training. The lesson pipeline worked at speed.

Lessons in defense

The analytical corpus runs deepest on defense, organizing lessons around two Ukrainian methods that Chinese analysts consider previews of potential attacks on China. The first is the

Figure 1: How Fast China Absorbs the Drone Warfare Innovations

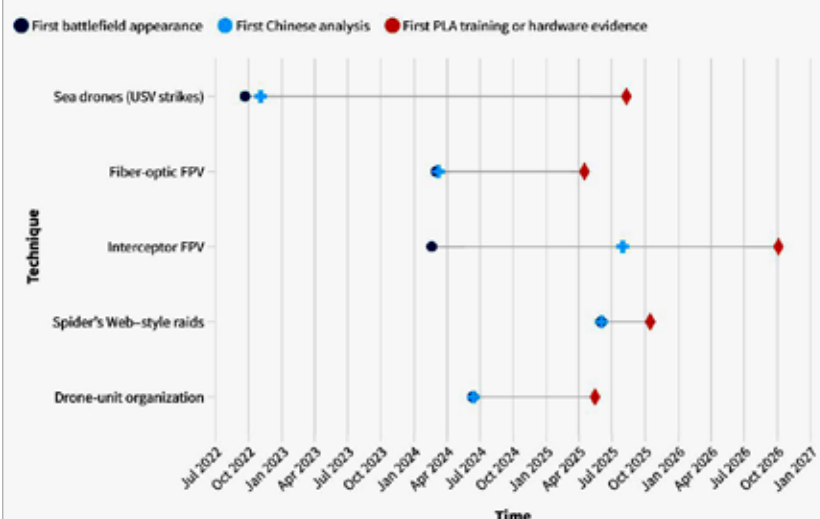
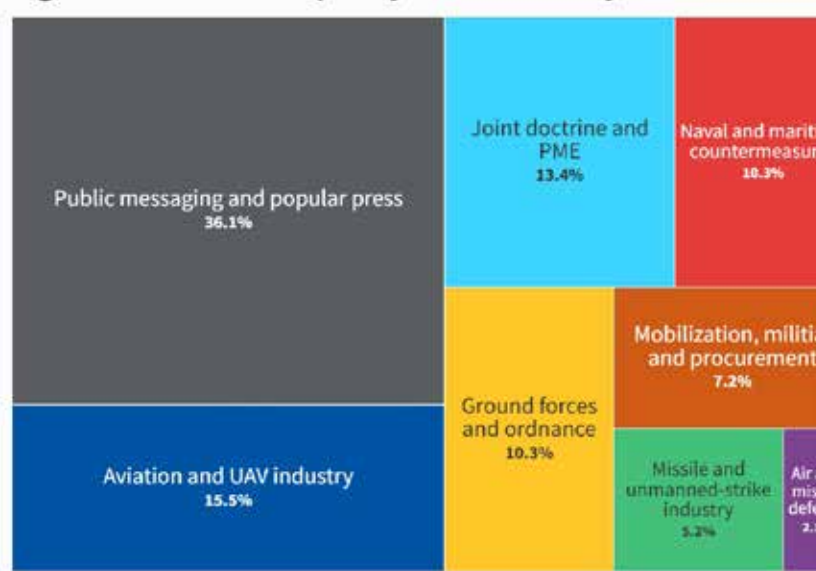


Figure 2: Research Corpus by End-User Ecosystem



Share of corpus = entries in the ecosystem divided by all entries, in percent, rounded to one decimal place. Shares may not add to exactly 100 because of rounding.

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