



PRIMER: Drone Warfare

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BOTTOM LINE UP FRONT

- Unmanned aerial vehicles (UAVs), or drones, are reshaping how wars are currently being fought, both offensively and defensively.
- The United States must work with allies and partners, particularly Ukraine and Israel, to integrate lessons from their drone warfare experience and defense industrial base innovation for faster and cheaper UAV production.
- The United States must effectively work to shut out China from our drone supply chains to prevent them from exploiting vulnerabilities in the event of a conflict.

BACKGROUND

Unmanned aerial vehicles (UAVs), or drones, are reshaping how wars are currently being fought, both offensively and defensively. Capable of being operated by a human or fully autonomously via software, they range from small commercial drones that can travel a few miles to military drones like Iranian Shaheds that can strike targets [1,150](#) miles away. Drones are changing the battlefield by allowing smaller nations to gain an asymmetric advantage by reducing the amount of artillery and traditional military resources necessary to wage a war. While the price tag of one Shahed drone is between [\\$20,000–\\$50,000](#), traditional U.S. air defense systems like Patriot interceptors cost [millions](#). Defense industrial base innovation in Ukraine has also demonstrated that drones can be produced exponentially more quickly than traditional capabilities. This imbalance shifts the traditional economics of conflict, affording resource constrained combatants more options when confronting larger powers.

HOW DRONES ARE SHAPING MODERN WARFARE

In the wake of Russia's full-scale invasion of Ukraine in 2022, over [200 Ukrainian companies](#) began producing combat drones, with small bootstrap producers using equipment like 3D-printers to produce drones for the war effort. In the four years since, Ukraine has emerged as a leading [expert](#) in drone development, currently capable of producing [2,000](#) interceptor drones per day. Estimates suggest Ukrainian drones are responsible for approximately [70 percent](#) of Russian casualties. Ukraine uses midrange drones to degrade Russia's supply chains by repeatedly striking [highways](#) that carry fuel, ammunition, and supplies. As evidence of their operational utility, Ukrainian drone strikes have damaged Russia's [oil refining capacity](#), forcing Russia to reroute fuel destined for Siberia to Moscow and even to import oil from Belarus. This shortage poses significant problems for Moscow as Ukraine has the ability to launch drones cheaply and much faster than Russia can repair its facilities.

One notable drone model is the Shahed, which was originally developed by Iran and has been used extensively by both [Iran](#) and [Russia](#). This model is [particularly](#) lethal due to a combination of its low production cost and relatively simple deployment style allowing it to overwhelm air defense systems through volume. Shahed drones are programmed to float over a target before striking with a focused warhead. Russia depends on Shahed variants to overwhelm Ukrainian air defenses, launching approximately [5,500](#) in October 2025 alone, while Iran uses them against U.S. and partner military installations in the [Middle East](#).

In Ukraine's [Operation Spiderweb](#) and Israel's [Operation Rising Lion](#), drones were integrated effectively into special forces operations behind enemy lines. In [Operation Spiderweb](#), 117 Ukrainian drones covertly launched from inside Russia destroyed an estimated 40 Russian planes, incapacitating [one-third](#) of Russia's bomber fleet. Similarly, Israeli special forces in [Operation Rising Lion](#) launched drones from inside Iran to take out Iranian air defense systems and communications networks, paving the way for a larger air assault by conventional aircraft.

In both operations, drones were able to significantly increase the amount of damage a small number of special forces behind enemy lines were able to cause.

POLICY RECOMMENDATIONS

- **Deepen co-production and investment in Ukraine's drone industry:** Ukrainian interceptor drones have proven remarkably effective downing 70 [percent](#) of Shahed drones and costing as little as \$3,000 to \$5,000. This stands in sharp contrast to Patriot interceptors—which the U.S. has used relied on to intercept Iranian drones—costing over \$3 million. Investing directly in Ukraine's defense industry would allow them to rely less on American stockpiles and provide the Washington valuable information about combat-tested technology as the United States scales up its drone production, while co-production arrangements could be used to encourage Ukrainian drone companies to build facilities and create jobs in the United States.
- **Leverage partner innovation to remove Chinese made drone components:** In late July, the Pentagon's Drone Dominance Program released [guidance](#) that military drones must be manufactured with U.S. parts. While a "wholly domestic" supply chain reduces risk from adversaries, it severely inhibits our ability to produce at scale. Ukraine has [significantly](#) reduced its reliance on Chinese components. Two Ukrainian companies that have built "[China-free](#)" drones were picked to compete for contracts in the Drone Dominance Program. The Pentagon should prioritize selecting more companies with proven records of success to achieve our goal of "China-free" military drones.
- **Authorize multi-year funding plans for drones:** Congress should authorize multiyear procurement plans for drone production so the United States Office of the Assistant Secretary of War for Industrial Base Policy (OASW/IBP) can work with American defense contractors to establish multi-year procurement plans (MYP) for drones. MYP would send a strong demand signal to industry and would incentivize these companies to increase drone production.
- **Translate UAV lessons between theaters:** The war in Iran has demonstrated that the utility of a comprehensive UAV and counter-UAVs strategy spans beyond the Russia-Ukraine war. We must learn from the Ukraine conflict and subsequently the conflict with Iran, and integrate those lessons into our military doctrine. We must also translate that knowledge so it can become applicable in other theaters, most notably, the Pacific theater.