The First Mass-Market Robots May Not Walk. They May Fly.

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Key Takeaways

- AI-powered drones are emerging as one of the first scalable forms of physical AI, combining autonomy, robotics and real-world action across multiple industries.
- Ukraine has demonstrated how low-cost drones can reshape modern warfare, accelerating government investment and domestic drone production.
- Rapid adoption across defense, agriculture, infrastructure and delivery highlights the long-term growth potential of the drone ecosystem and the WisdomTree Physical AI, Humanoids and Drones Fund (WDRN).

For the past several years, artificial intelligence has lived primarily on a screen. You type a prompt. You receive an answer. The exchange is useful, sometimes remarkable, but fundamentally disembodied. AI sees and speaks, but it does not act in the physical world.

That is beginning to change. The term physical AI describes systems that combine perception, reasoning, and motion to operate in real environments, not as simulations, but as machines that move through space, respond to conditions, complete tasks, and learn from the world around them. Humanoid robots are often cited as the most vivid example of this shift, and the imagery is compelling.

But the first genuinely mass-market, strategically consequential physical AI may not walk on two legs. It may fly.

Drones

Drones are not a new technology. What is new is their convergence with autonomy, scale manufacturing, and national strategic priority, all at the same time.

Drones have been evolving for decades:

- Remote-controlled hobby aircraft emerged in the 1980s and 1990s
- Camera platforms became widespread in the 2010s
- AI-enabled autonomous systems are emerging in the 2020s

What makes the current moment different is that several things are happening simultaneously.

1. Autonomy software is maturing
2. Component costs are falling
3. Battlefield experience, particularly from Ukraine, has demonstrated real-world capability at scale
4. Governments, most notably the United States, are beginning to treat drones as strategic infrastructure rather than specialized defense gadgets

The investment implications could be significant. Drones sit at the intersection of AI, defense, robotics, geopolitics, semiconductors, batteries, logistics, and industrial policy. Few emerging technologies touch that many structural investment themes at once.

From Toy to Tool to Critical Infrastructure

What we are seeing in drones today is the addition of genuine autonomy. A drone that requires a skilled pilot is a tool. A drone that can navigate GPS-denied environments, avoid obstacles, coordinate with a swarm, and complete a mission without continuous human input is something closer to a robot. It perceives the world, reasons about it, and acts. That is the physical AI inflection point.

The building blocks of that autonomy are now familiar from the broader AI story:

5. Cameras
6. LiDAR
7. Radar
8. Thermal sensors
9. Inertial measurement units
10. Machine learning models that fuse those inputs into coherent situational awareness

Route planning, object avoidance, target identification, swarm coordination, and mission management are all active areas of software development. The key advance is not any single component but their integration into systems that operate reliably in complex, uncontrolled environments.

The Ukraine Lesson: A Structural Repricing of Conflict

If there is a single set of data points that changed how defense planners and strategists think about drones, it comes from Ukraine. The conflict beginning in 2022 became the first large-scale laboratory for drone warfare, and the lessons have reverberated through every serious defense establishment in the world.

The most important lesson is economic. Consider the cost structure of drones used in that conflict, drawn from public reporting and defense research:1

- **Custom FPV drone:** approximately $300 to $1,000 (a first-person-view drone, assembled from commodity components and piloted via a live video feed from a camera mounted on the airframe; widely used in Ukraine as a low-cost strike and reconnaissance tool)
- **DJI Mavic commercial platform:** approximately $2,000 (a compact, consumer-grade quadcopter made by China's Da-Jiang Innovations (DJI), the world's dominant drone manufacturer; widely available and used for photography, reconnaissance, and battlefield observation by both sides in Ukraine)
- **Shahed-136 loitering munition:** approximately $35,000 (an Iranian-designed "kamikaze" drone that circles a target area until it identifies something to strike, then dives into it; supplied to Russia and used extensively against Ukrainian infrastructure; a loitering munition is sometimes called a "suicide drone" because it destroys itself on impact)
- **Switchblade 300 kamikaze drone:** approximately $100,000 (an American-made loitering munition produced by AeroVironment, small enough to be carried in a backpack and launched from a tube; it can loiter over a target area, be redirected or aborted mid-flight, and then dive to strike; supplied to Ukraine by the U.S. government)
- **Bayraktar TB2 tactical drone:** approximately $5 million (a medium-altitude, long-endurance armed drone made by Turkey's Baykar; roughly the size of a small aircraft, capable of flying for 24+ hours, carrying laser-guided munitions, and operating at ranges exceeding 100 miles; became a symbol of drone warfare effectiveness in the early phases of the Ukraine conflict)

The implication is stark. A thousand-dollar drone operated with skill and in sufficient numbers can threaten systems worth many times its cost. Ukrainian sources have claimed that drones were responsible for a substantial majority of battlefield casualties in certain phases of the conflict. Ukraine reportedly produced more than 4 million drones in 2025 and is targeting production of more than 7 million drones in 2026, underscoring how rapidly drone manufacturing has scaled into a wartime industrial base.2

This is not simply a lesson about low-cost weapons. It is a lesson about the industrial logic of conflict. Nations that can produce drones at scale, iterate rapidly on design, and sustain high-volume attrition have a structural advantage. Nations whose defense industries are optimized for exquisite, expensive systems face a different and more difficult challenge.

The United States faces exactly that challenge. As of late 2025, Bloomberg reported that the U.S. manufactures approximately 100,000 military drones per year. Ukraine, by that same point, had reached an annual production rate of roughly four million, a figure that reportedly exceeds the combined output of every NATO member. Ukrainian capacity has since climbed further, with officials citing the ability to produce up to ten million drones annually. The U.S. Army has announced ambitions to reach 10,000 drones per month by 2026, which would roughly double current domestic output. That contrast between ambition and current reality on one side and demonstrated wartime scale on the other is a benchmark, not an indictment. But it is the kind of gap that focuses institutional attention.3

The Government as Capital Allocator, Not Just Customer

As of late May 2026, the *Wall Street Journal* reported that the Trump administration is in active talks to fund domestic drone companies, not merely as a customer purchasing finished products, but as a capital provider helping to build production capacity.4 The discussions have included the Office of Strategic Capital, a Biden-era lending unit established specifically to fund companies critical to national security supply chains. Companies under consideration for possible funding include Performance Drone Works, which secured a contract to supply the Army with reconnaissance drones; Unusual Machines, a drone components supplier; and Neros Technologies, a Sequoia Capital-backed startup building small FPV drones.

The scale of the commitment is striking. Pentagon budget documents released in April 2026 show a request of $54.6 billion for the Defense Autonomous Warfare Group, the office that absorbed the earlier Replicator drone initiative, for fiscal year 2027. That compares to $225.9 million the DAWG received in FY2026, its inaugural year. The bulk of the FY2027 request, roughly $53.6 billion, sits in the reconciliation portion of the budget rather than the base, meaning Congressional approval remains a precondition. But the directional signal from the Pentagon's own budget documents is unambiguous.5

This involves reported discussions, not completed deals. The path from expressed intent to signed agreements to production capacity at scale involves many steps, each with uncertainty. But the direction is unambiguous.

Why Drones, and Why Now: The Use Case Landscape

Defense is the proximate catalyst, but it is not the full story. Drones are becoming useful, sometimes indispensable, across an expanding range of civilian and commercial applications. The breadth of these use cases is part of what makes drones a distinctive investment theme.

Agriculture

Agricultural drones are already operating at significant scale, particularly in Asia. According to DJI’s 2025 annual report, approximately 400,000 agricultural drones were in use globally by end of 2024, a 90% increase from 2020, and have cumulatively treated more than 500 million hectares of farmland across more than 100 countries. DJI has stated that its drones now service roughly one-third of all farmland in China. In the United States, precision agriculture applications, variable-rate spraying, crop health monitoring, yield estimation, and livestock management, are growing but remain early-stage relative to the potential.6

Infrastructure Inspection

Power lines, pipelines, bridges, cell towers, wind turbines, solar installations, and building facades all require regular inspection. Traditionally this means human inspectors in difficult, sometimes dangerous conditions. Drone inspection is faster, cheaper, and in many cases more thorough, as sensors can capture data at angles or in conditions inaccessible to human crews. Utilities, energy companies, construction firms, and municipalities are all active adopters. The recurring nature of inspection creates durable demand.

Emergency Response and Public Safety

The Law Enforcement Drone Association estimates that approximately 6,000 U.S. police drone programs were operating by end of 2025, up from roughly 1,500 just a year earlier, a fourfold increase driven in large part by the FAA's streamlined approval process for Drone as First Responder programs.7 The capability is intuitive: a drone can arrive at a scene faster than ground units, provide aerial situational awareness, support search and rescue in terrain that is difficult to navigate on foot, and monitor large public gatherings. A significant unlock for public safety applications is regulatory. Once beyond-visual-line-of-sight (BVLOS) operations are approved in a given jurisdiction, drone missions expand dramatically. The NYPD's experience is illustrative. After receiving FAA approval in September 2024 to fly drones beyond visual line of sight across New York City, the first approval of its kind for any U.S. police department, the department conducted 6,546 drone flights in the first half of 2025, compared to 647 in the same period a year earlier, a tenfold increase in twelve months.8

Delivery

By January 2026, Zipline had surpassed two million cumulative commercial deliveries, having completed its first million in 2024 alone, and raised more than $600 million to fund expansion into at least four U.S. states. Wing, the Alphabet-owned operator, announced plans that same month to expand its Walmart partnership to more than 270 U.S. store locations by 2027, serving roughly 10% of the U.S. population. Amazon's Prime Air program remains active but more limited, having faced operational setbacks with its MK30 drone throughout 2025. In China, data from the Ministry of Transport shows approximately 2.7 million parcels were delivered by drone in 2024, the year Chinese officials designated as the beginning of the country's low-altitude economy era.9

Mapping and Surveying

Construction sites, mining operations, urban planning, disaster response, and real estate all generate demand for aerial mapping. Drones equipped with photogrammetry software can produce three-dimensional models of terrain or structures in hours rather than days. The data has practical applications in project management, safety monitoring, asset documentation, and regulatory compliance.

How to Think About Scale

Long-range forecasts in emerging technology are not predictions. They are attempts to describe the direction and magnitude of gravitational pull. With that caveat clearly stated, research from major financial institutions has sketched scenarios in which global drone counts reach roughly 130 million by 2030, 900 million by 2040, and potentially two billion by 2050, primarily small unmanned aerial systems. Hardware revenue estimates across some scenarios reach into the trillions of dollars by mid-century.10

The precision of those numbers matters less than the order of magnitude. The scenario being described is one in which drones move from products sold to hobbyists and specialists to installed robotic infrastructure—persistent, networked, autonomous systems embedded in the physical world much as smartphones are embedded in daily life.

The WisdomTree Physical AI, Humanoids, and Drones Fund (WDRN) places a significant focus on publicly listed companies involved in the drone economy.11 As of May 28, 2026, the strategy also had zero investment in China-domiciled physical AI companies, including those involved with drones.

1 Source: Morgan Stanley Global Embodied AI Team. (2025, December). *The Robot Almanac: Vol. 4: Drones & Air Mobility*. Morgan Stanley Research.

2 Source: Wall, R. (2026, April 21). *Ukraine eyes drone production topping 7 million units*. Aviation Week.

3 Sources: Ukrainska Pravda. (2025, November 12). *Ukraine has become "drone superpower" and produces 4 million UAVs per year – Bloomberg*; Defense News. (2025, October 15). *Army's big drone ambition runs into the hard part: scaling up*.

4 Source: Somerville, H., & Ramkumar, A. (2026, May 27). *The Trump administration is in talks to fund U.S. drone companies*. *The Wall Street Journal*.

5 Source: Grady, J. (2026, April 29). *Hegseth: Autonomous warfare sub-unified command coming soon*. DefenseScoop.

6 Sources: DJI Agriculture. (2025, April 30). *DJI Agriculture's annual report reveals drone-powered farming revolution at Brazil's Agrishow 2025*. DJI; Barnard, M. (2025, April 25). Third of China's farms sprayed by drones, marking agricultural revolution. CleanTechnica.

7 Source: DroneXL. (2025, December 31). *Police drone programs hit 6,000 nationwide as legal challenges mount*.

8 Source: DroneXL. (2025, November 21). *NYPD drone flights surge 3,200% as watchdog warns of unchecked surveillance*.

9 Sources: Zipline International Inc. (2026, January 21). *Zipline surpasses 2 million deliveries, raises more than $600M to power next phase of growth, and expands operations to Houston and Phoenix* [Press release]. GlobeNewswire; Coldewey, D. (2026, January 11). *Wing to expand drone delivery to another 150 Walmart stores*. TechCrunch; State Council Information Office of China. (2025, February 8). *China's low-altitude logistics sector takes flight, transforms delivery systems*.

10 Source: Morgan Stanley Global Embodied AI Team. (2025, December). *The Robot Almanac: Vol. 4: Drones & Air Mobility*. Morgan Stanley Research.

11 WDRN is designed to track the total return performance of the WisdomTree Physical AI, Humanoids and Drones Index. Drones are one of the major physical AI verticals of business activity focused upon within this strategy.

Important Risks Related to this Article

For current holdings of WDRN, please click here. **Holdings are subject to risk and change.**

There are risks associated with investing, including possible loss of principal. Companies engaged in Physical AI Activities are subject to unique regulatory, operational and technological risks, such as intense competition and potentially rapid product obsolescence. The regulation of such companies in the United States and other countries is diverse and rapidly evolving, which may inhibit or delay adoption. These companies are also heavily dependent on intellectual property rights and may be adversely affected by loss or impairment of those rights. Companies engaged in Physical AI Activities typically invest significant amounts of spending on research and development, and there is no guarantee that the products or services produced by these companies will be successful. Humanoid robotics companies are sensitive to trends in industrial production, capital-expenditure cycles, supply-chain conditions, and adoption rates of automation technologies across varied sectors including business and industrial end-users.

Humanoid robotics companies may have long and capital-intensive development timelines, highly uncertain paths to profitability and large-scale deployment, and limited product lines, markets, financial resources or personnel. Drone companies may be dependent on the U.S. Government and its agencies for a significant portion of their revenues, and the commercial and military adoption of drone technologies remains subject to extensive and evolving governmental oversight, including aviation safety standards, airworthiness certification requirements, export controls, and national security reviews. A fund that has a portfolio that is concentrated in the securities of issuers in a particular industry or group of related industries, may be adversely affected by the performance of those securities, and more susceptible to adverse economic, market, political, or regulatory occurrences affecting that industry or group of related industries.

Investments in non-U.S. securities involve political, regulatory, and economic risks that may not be present in U.S. securities. For example, foreign securities may be subject to risk of loss due to foreign currency fluctuations, political or economic instability, or geographic events that adversely impact issuers of foreign securities. Investments in securities and instruments traded in developing or emerging markets, or that provide exposure to such securities or markets, can involve additional risks relating to political, economic, or regulatory conditions not associated with investments in U.S. securities and instruments or investments in more developed international markets.

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