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EMERGING SPACE BRIEF

Counter-Unmanned Aerial Systems

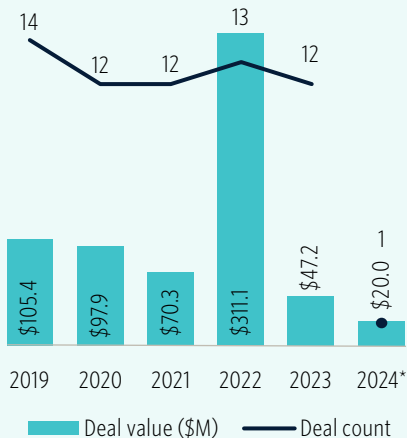
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Trending companies



C-UAS VC deal activity



Source: PitchBook • Geography: Global
*As of January 31, 2024
Note: Data excludes Anduril.

Note: While we have included Anduril in the C-UAS Emerging Space, we have not included it in this data analysis given its outsized deal activity in the broader defense tech sector.

Overview

“Counter-unmanned aerial systems” (C-UAS) are defensive technologies and strategies designed to detect, track, and neutralize unmanned aerial vehicles, commonly known as drones. These systems encompass a range of techniques, including radar detection, electronic jamming, and physical interception methods. C-UAS are essential for ensuring security and privacy and are increasingly used in military, commercial, and civilian contexts to protect against unauthorized or potentially harmful drone activities.

Background

The rapid expansion of drone technology across recreational, commercial, and military domains presents distinct security challenges, catalyzing the evolution of C-UAS. These advanced solutions are engineered to detect, track, and neutralize uncrewed aerial threats, addressing the complexities of drone usage in diverse environments such as the Red Sea and Ukraine. The ease of retrofitting older drones with sophisticated guidance systems, coupled with their low cost of production—formidable exploding drones can be created for just a few thousand dollars—underscores the need for effective C-UAS measures. This asymmetry, wherein inexpensive drones can be countered by costlier missile systems, offers adversaries a strategic advantage.

In response, entities such as the US Department of Defense (DoD) are significantly investing in C-UAS research & development (R&D) (\$667.0 million) and procurement (\$78.0 million).¹ Beyond military uses, the growing concerns over privacy and infrastructural integrity signal a broader application for C-UAS technologies. This expansion reflects an acute awareness of the need to safeguard against evolving aerial threats in an increasingly drone-populated airspace, indicating a promising future for the C-UAS market in both defense and civilian sectors.

1: “Department of Defense Counter-Unmanned Aircraft Systems,” Congressional Research Service, April 17, 2023.

Technologies and subsegments

C-UAS can be divided into two categories: detection and mitigation.

Detection technologies*

Technology	Description	Advantages	Disadvantages	Example startup
Radar	<ul style="list-style-type: none"> Uses radio waves to identify and track drones Tailored for smaller targets 	<ul style="list-style-type: none"> Long range Accurate Handles multiple targets 	<ul style="list-style-type: none"> Range depends on drone size Cannot distinguish birds Affected by adverse weather conditions 	
Radio frequency (RF) analyzers	<ul style="list-style-type: none"> Sensors that capture and analyze drone communication signals, allowing for identification 	<ul style="list-style-type: none"> Low cost Multiple drone detection Passive Can triangulate positions 	<ul style="list-style-type: none"> Limited by range Less effective in RF-dense environments or against drones not using RF communication Dependent on constantly updated drone libraries 	
Electro-optical sensors	<ul style="list-style-type: none"> Use a spectrum of light to identify drones Enhanced with AI for better detection and identification 	<ul style="list-style-type: none"> Allow for visual confirmation and evidence collection Operate effectively both day and night 	<ul style="list-style-type: none"> Prone to high error rates in adverse weather conditions Less reliable in low visibility 	
Acoustic sensors	<ul style="list-style-type: none"> Detect drone presence through sound analysis, employing arrays for direction finding and triangulation 	<ul style="list-style-type: none"> Effective for close-range detection Complement visual detection methods Portable and passive 	<ul style="list-style-type: none"> Performance drops in loud environments Limited to short-range detection 	

Sources: [Center for the Study of the Drone](#) and PitchBook • Geography: Global • *As of January 31, 2024

Mitigation technologies*

Technology	Description	Advantages	Disadvantages	Example startup
RF jammers	<ul style="list-style-type: none"> Equipment that blocks drone signals by overwhelming them with RF energy 	<ul style="list-style-type: none"> Cost-effective Avoid physical damage 	<ul style="list-style-type: none"> Limited range Potential interference with other signals Can cause drones to behave erratically 	
GPS spoofers	<ul style="list-style-type: none"> Devices that override drone GPS data, misleading them about their location 	<ul style="list-style-type: none"> Cost-effective Avoid physical damage 	<ul style="list-style-type: none"> Limited operational range Potential to disrupt nontarget systems 	
High-power microwave (HPM) devices	<ul style="list-style-type: none"> Generate pulses that disrupt electronics within drones and other devices 	<ul style="list-style-type: none"> Stop drones effectively in proximity 	<ul style="list-style-type: none"> Expensive Could interfere with nearby electronics Drones may crash uncontrollably 	
Nets	<ul style="list-style-type: none"> Capture drones with nets Delivered via various methods, including ground and drone deployment 	<ul style="list-style-type: none"> Enable drone capture for analysis Accurate Minimize surrounding damage 	<ul style="list-style-type: none"> Can create debris May miss targets Reloading and range limitations Challenges with fast-moving drones 	
High-energy lasers	<ul style="list-style-type: none"> Produce intense light beams to physically damage drones 	<ul style="list-style-type: none"> Extended range Efficient cost of neutralization No ammunition required 	<ul style="list-style-type: none"> Bulky In developmental phase Potential safety hazards to nearby air traffic and people 	
Cyber takeover systems	<ul style="list-style-type: none"> Identify drones by their RF emissions to remotely take control 	<ul style="list-style-type: none"> Accurate Minimal risk to surroundings Work on controlled and free-flying drones 	<ul style="list-style-type: none"> Effectiveness varies against state-owned drones 	

Sources: [Center for the Study of the Drone](#) and PitchBook • Geography: Global • *As of January 31, 2024

Applications

C-UAS technologies find applications across a diverse range of sectors, catering to an equally varied customer base. In the military and defense realm, these systems are crucial for protecting sensitive installations, personnel, and operations from aerial threats. Homeland security agencies deploy C-UAS to safeguard critical infrastructure such as airports, government buildings, and national landmarks. The commercial sector, including large-event organizers and private corporations, is increasingly adopting these technologies to ensure security against unauthorized drone activities that could compromise privacy or safety. Airports and other transportation hubs also use C-UAS to prevent disruptions and potential threats from rogue drones. In the realm of public safety, law enforcement and emergency services use these systems for crowd control and during major public events to mitigate the risk of drone-related incidents. Additionally, there is growing interest in C-UAS technologies from the energy sector, particularly for protecting power plants and electrical grids. The agricultural and environmental sectors also see potential in using these systems to monitor and protect against illegal drone activities that could harm wildlife or disrupt sensitive ecological areas.

Limitations

The limitations of current C-UAS technologies present significant challenges in the evolving landscape of drone defense. A critical constraint lies in the inherent “cat-and-mouse” nature of drone and counter-drone technologies. As drone capabilities advance, C-UAS solutions must continually adapt to remain effective. This constant evolution demands ongoing R&D, which can be costly and time-consuming.

Furthermore, the regulatory environment for C-UAS technologies, particularly in the US, remains ambiguous and restrictive. While effective, techniques such as jamming and spoofing currently fall into a legal gray area, complicating their deployment. This regulatory uncertainty may hinder market growth, although clearer guidelines are anticipated as the risks associated with unauthorized drone activities become more pronounced.

Another notable limitation is the ceiling in government funding, especially relevant to startups in the C-UAS space. While the DoD is a significant customer, it is known for long sales cycles, making it challenging for startups to rely solely on government contracts for revenue. This necessitates a go-to-market strategy targeting the commercial sector. The commercial sector, with its diverse range of potential applications—from event security to infrastructure protection—offers a more immediate revenue stream, albeit with its own set of challenges and competition.

A significant concern in drone mitigation strategies is the risk of collateral damage. Technologies such as RF jammers and spoofers may unintentionally disrupt other electronic systems or communications, thus compromising their efficacy in certain environments. Similarly, kinetic solutions such as interceptors or high-energy lasers can cause physical collateral damage, both to property and bystanders, particularly in densely populated areas.

Another challenge is the emerging threat of swarm drone attacks, wherein multiple drones operate in coordination. Current C-UAS technologies face ambiguity in effectively countering such swarms, as many systems are designed to track and neutralize single drone threats. This complexity, however, opens up opportunities for startups in the sector. Customers are increasingly looking for layered solutions that combine various detection and mitigation techniques to create a comprehensive defense system against a range of drone threats, including swarms.

This trend toward integrated, multitechnology solutions highlights the importance of software-forward approaches in C-UAS development. Advanced software can better orchestrate mitigation techniques, efficiently manage resources, and more rapidly adapt to evolving drone threats. Moreover, an intuitive user experience is crucial, as it enables operators to effectively manage and respond to threats without needing extensive technical expertise.

Recent deal activity and market outlook

With just \$1.1 billion invested from 2019 to 2023 and more than \$700 million in DoD R&D funds designated for 2023 alone, it is evident that the C-UAS space is undercapitalized. In January 2024, Hidden Level raised \$20.0 million from Booz Allen Ventures, Valor Equity Partners, and Veteran Ventures Capital for its sensor technology, putting its valuation at \$120.0 million with a 2.1x valuation step-up. Anduril's recent release of the Roadrunner, a reusable alternative to missile systems, indicates that major defense tech players are expanding into the counter-drone space. That said, the market outlook for C-UAS technology is marked by cautious optimism. Companies focusing on a software-driven approach and advanced sensor fusion are increasingly prominent in this sector. These organizations are distinguishing themselves by providing flexible solutions that can be either integrated or modular, catering to a diverse range of needs in both defense and commercial realms. This adaptability is a significant factor in their market relevance.

Moreover, the emergence of startups in the C-UAS space is noteworthy, especially considering their cost-effective solutions. Compared to the more expensive systems developed by established defense contractors, these startups often offer C-UAS technologies at significantly lower price points, typically in the tens of thousands of dollars. This cost difference makes these solutions more accessible and could potentially broaden their market appeal.

As the challenges posed by uncrewed aerial threats evolve, the need for effective C-UAS solutions continues to grow. The market is thus poised for further development, with opportunities for both new entrants and established players. The success in this sector may depend largely on the ability to balance technological sophistication with cost-effectiveness and adaptability to diverse use cases.

Quantitative perspective

For a deeper dive into the data and to explore additional insights, visit the PitchBook Platform or [request a free trial](#).

110 companies	213 deals	\$4.3M capital invested	326 investors
21 deals (TTM) -4.6% YoY	\$64.3M capital invested (TTM) -96.4%	\$3.4M median deal size (TTM) -31.7%	\$60.7 median post valuation (TTM) -42.4%

*As of January 31, 2024

Top C-UAS companies by total raised*

Company	Total raised (\$M)	Latest deal value (\$M)	Last deal date	Deal type	HQ location	Year founded
Epirus	\$293.6	\$0.2	November 30, 2022	Grant	Redondo Beach, US	2018
Dedrone	\$133.0	N/A	December 14, 2023	Late-stage VC	Sterling, US	2014
Axient	\$90.3	\$82.3	February 4, 2021	Debt - general	Huntsville, US	1991
DroneShield	\$67.1	\$7.6	February 6, 2023	PIPE	Sydney, Australia	2013
SkySafe	\$54.9	N/A	N/A	Late-stage VC	San Diego, US	2015
Fortem Technologies	\$51.4	\$17.8	February 21, 2023	Late-stage VC	Pleasant Grove, US	2016
Hidden Level	\$40.9	\$20.0	January 12, 2024	Early-stage VC	Syracuse, US	2018
D-Fend Solutions	\$34.5	\$28.0	September 24, 2019	Early-stage VC	Ra'anana, Israel	2016
WhiteFox Defense Technologies	\$29.5	\$5.3	June 7, 2021	Late-stage VC	San Luis Obispo, US	2015

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Note: Data does not include Anduril.

Top C-UAS companies by Exit Predictor opportunity score*

Company	Opportunity score	Success probability	M&A probability	IPO probability	Total raised (\$M)	HQ location	Year founded
Walaris	79	72%	71%	1%	\$5.3	Peachtree Corners, US	2017
Hidden Level	74	87%	86%	1%	\$40.9	Syracuse, US	2018
Epirus	68	86%	35%	51%	\$293.6	Redondo Beach, US	2018
CerbAir	66	62%	61%	1%	\$8.5	Montrouge, France	2015
D-Fend Solutions	58	71%	59%	12%	\$34.5	Ra'anana, Israel	2016
WhiteFox Defense Technologies	55	53%	52%	1%	\$29.5	San Luis Obispo, US	2015
Dedrone	53	97%	84%	13%	\$133.0	Sterling, US	2014
Vizgard	53	51%	50%	1%	\$0.8	London, UK	2020
SkySafe	48	62%	58%	4%	\$54.9	San Diego, US	2015

Source: PitchBook • Geography: Global • *As of January 31, 2024

Note: Probability data is based on [PitchBook VC Exit Predictor methodology](#). Data does not include Anduril.

Top C-UAS companies by active patents*

Company	Active patent documents	Total raised (\$M)	HQ location	Year founded
Fortem Technologies	32	\$51.4	Pleasant Grove, US	2016
Epirus	20	\$293.6	Redondo Beach, US	2018
D-Fend Solutions	19	\$34.5	Ra'anana, Israel	2016
Dedrone	17	\$133.0	Sterling, US	2014
Regulus Cyber	15	\$10.3	Haifa, Israel	2016
SkySafe	12	\$54.9	San Diego, US	2015
AeroDefense	11	N/A	Oceanport, US	2015
KMB Telematics	10	\$0.4	Arlington, US	2018
DroneShield	8	\$67.1	Sydney, Australia	2013
SightLine Applications	6	N/A	Hood River, US	2007
WhiteFox Defense Technologies	6	\$29.5	San Luis Obispo, US	2015

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Top C-UAS investors*

Investor	Investments	HQ location
United States Department of Defense	10	Washington, US
DCVC	5	Palo Alto, US
F2 Venture Capital	5	Tel Aviv, Israel
8VC	4	Austin, US
AEI HorizonX	4	Boca Raton, US
Menlo Ventures	4	San Francisco, US

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 Note: Data does not include Anduril.

Recommended reading

- [“Big Problems With Counter Drone Technology \(Anti Drone Guns, Drone Jammers, etc.\),” Rupperecht Law P.A., Jonathan Rupperecht, n.d., accessed January 25, 2024.](#)
- [“Counter-Small Unmanned Aircraft Systems Strategy,” US Department of Defense, January 7, 2021.](#)
- [“Department of Defense Counter-Unmanned Aircraft Systems,” Congressional Research Service, April 17, 2023.](#)
- [“The Challenges of Counter-Drone Technology as Seen in Recent Conflicts,”](#)