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Military Innovation

An Analysis of the Role of Defense Technology Startups

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Abstract: Alongside traditional military equipment suppliers, defense technology startups have been playing a growing role in military innovation since their emergence in the past decade. This article examines the actual capacity of these startups to deliver, examining their business models, their interconnectivity with the defense sector, and their collaboration with national and allied authorities. The article ultimately intends to highlight the critical importance of promoting a robust startup ecosystem to ensure technological superiority and secure military readiness.

Keywords: drones, uncrewed vehicles, unmanned aerial vehicle, UAV, unmanned aerial system, UAS, technology, innovation, industry, artificial intelligence, AI, startups

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Introduction

The use of uncrewed vehicles (to include land, air, sea, and subsea) and the digitalization of military processes are now a regular part of warfare, as exemplified in the Russo-Ukrainian War, the Gaza War between Israel and Hamas, and the Twelve-Day War between Iran and Israel.[1] Uncrewed vehicles, together with the Internet of Military Things, which is the interconnectivity of military devices for capturing and processing data, offer significant rewards for military tactics, such as all-time intelligence, surveillance, and reconnaissance; rapid and precise strikes; and reduced risk to personnel.[2] For that reason, it is critical that armies are equipped with uncrewed vehicles and appropriate software, with the constrains to be resilient as much as possible to electronic warfare and jamming and to adapt logistics and supply chains accordingly to the front lines.

This transition to a new form of warfare runs parallel with current innovations in military technologies, which is run by the industrial sector of defense. Both in the United States and Europe, well-established defense companies have been engaged in this innovation field. In addition to these companies, there is also a noteworthy emergence of startups that are contributing to the development of uncrewed vehicles. These startups are particularly interesting because they allow for faster and sometimes more adventurous prototyping than the established players. However, they are less efficient when it comes to production due to inherent financial and manufacturing limitations, and as a result they cannot escape partnering closely with major defense companies.

The article discusses how defense technology startups operate within their industrial sector and why they matter in bringing military technology to

the next level. To be as practical as possible, this analysis uses a sample of European startups. Analyzing their development stories and business models helps illustrate how typical defense technology startups operate. The sample is composed of the following startups (table 1).

Table 1. Sample of European defense technology startups

Startup	Creation	Incorporation	Product	Current series	Total fundraising
Aeralis	Early 2010s	United Kingdom	Drones (air)	N/A	$16.8 million USD
ARX Robotics	2023	Germany	Drones (land)	A	€41 million EUR (approximately $47.2 million USD)
Helsing	2021	Germany	Drones (air)	C	€760 million EUR (approximately $875 million USD)
Milrem Robotics	2013	Estonia	Drones (land)	A	€38 million EUR (approximately $43.7 million USD)

Source: courtesy of the author.

This table aims to offer an overall presentation of the sampled defense technology startups. More information will be provided later in this article on them, as well as on the specificities of the startup ecosystem, which is essentially governed by the concepts of series and fundraisings. For now, the table shows that the sample is composed of startups that develop and sell hardware and/or software with a strong focus on uncrewed devices, deployable either in the air (Aeralis and Helsing) or on land (ARX Robotics and Milrem Robotics). The startups have different levels of maturity—ARX Robotics and Milrem Robotics are the most junior (Series A), while Helsing is the most mature (Series C). This sample therefore presents a snapshot of defense technology startups at difference stages, such as when testing

prototypes in early stages and when moving to industrial production and selling to forces in later stages.

This article first analyzes how the sampled defense startups place themselves and connect within the defense sector. To secure a spot within their sector, defense technology startups need to come up with a value proposition—that is, to sell something new that the existing players have not developed yet, or at least not to the same extent. For many startups, the differentiating proposition is a cutting-edge software tool or uncrewed vehicle marked by the use of artificial intelligence (AI) or at the very least highly advanced algorithms and machine learning.[3] However, being disruptive must not isolate the defense technology startups, since they cannot operate without the financing, advisory, partnership, and production capabilities of the already established defense companies. Therefore, the defense technology startups have a vital need for interconnectivity with their sector, all the more so as if they possess the ultimate objective of being acquired by a larger company at some point in time.

The second and last part of this article looks at the interaction between the defense technology startups and the public sector. Obviously, military equipment is solely purchased by states for their armed forces. Therefore, the armed forces are instrumental for testing and providing relevant feedback and returns of experience for the development of efficient and innovative products. In addition, the public sector—to include national governments, the European Union (EU), and the North Atlantic Treaty Organization (NATO)—is a major provider of financing for military innovation. Indeed, these governments and organizations have a clear agenda for steering and boosting the growth of defense technology startups in their

territories. Moreover, there is the noteworthy and cautious return of private investors to the defense sector, primarily driven by the easing of environmental, social, and governance criteria for defense, as well as the return of high-intensity conflicts and the subsequent rearmament of NATO countries.

While the ethics of the use of technology in the armed forces, particularly with regard to uncrewed vehicles, are not covered in this article, there is no intention to be dismissive about this fundamental aspect. The use of technology in warfare must be compliant at all times with the laws of armed conflict, the principles of international humanitarian law, national legal frameworks, and the highest moral and ethical standards. The startups selected for this sample have self-declared to be compliant with all the EU and NATO standards.

The Emergence of Defense Technology: Integrating a Highly Fragmented and Specialized Ecosystem within the Wider Military Innovation System

This part analyzes the place occupied by the defense technology startups within the defense sector as well as their strategies to find a market spot and develop there. The first section presents some key functioning of startups in general, as many defense technology startups follow the same logic and it is necessary to have a fair understanding of their specificities to follow the rest of the analysis. The second section investigates which business strategies are used by defense technology startups, based on the sample. Finally, the third section examines how defense technology startups interact and collaborate with the large defense suppliers.

Key Specificities of the Startup Ecosystem

Defense technology startups belong to the broader startup sector, which essentially refers to young companies created around the project to commercialize a product that uses state-of-the-art technology, such as algorithms, machine learning, or large language models. Startups develop for most software tools that intend to digitalize existing processes that have historically been manual and burdensome, such as bookkeeping.[4] Their disruption is somewhat limited as their innovation does not fundamentally change an industry, but they dramatically improve ways of working by improving efficiency through automation of tasks. In addition, there are also a handful of startups that invent new hardware solutions embedded with software, which could completely change the ways of working by proposing a very innovative solution. Examples of this include 3D printing for medical purposes or uncrewed devices for use in the defense sector, which is analyzed here. Regardless of the levels of disruption and innovation that they introduce, startups all follow the same logic and growth path.

The first key concept is fundraising. Startups are businesses created from scratch. Hence, the founders, who first have the idea for a product, must find financing to develop their company. The price for launching a new business depends on the complexity of the product and the needed know-how; for example, it can go from a rather straightforward software tool for client relationship management to a highly complex uncrewed aircraft. The initial financing therefore variates between some hundreds of thousands of dollars to several millions. The market shows that initial financing is generally in the one-digit-million range, which is an amount that the founders cannot afford with their own capital—and even if they could, they would most likely

not be willing to take on the risk of creating a new company with their own money.

Consequently, founders typically approach private equity funds, venture capital funds, or private investors to raise capital. This is called *fundraising*.[5] The investors become shareholders of the company, as investments are typically in the form of equity, though there are some cases in which it is a debt. They expect a return on investment, betting on the success of the startup. Consequently, the investors also bear a share of the risk that the company will not succeed at all or will develop slower than forecasted. When it comes to defense startups, most have the particularities to require significant financing from inception to be able to develop a high-end technological product, and as a result, there is a higher risk that the product does not work and/or needs several rounds of corrections and improvements, thereby delaying commercialization.[6]

The concept of fundraising is linked to the concept of series. Each fundraising round typically denotes a level of maturity of the startup, because it raises capital as soon as a milestone has been reached. Instead of being termed Fundraising 1, 2, 3, etc., the naming convention includes Series A, B, C, D, and E. Any Series beyond E, which is rare, is called Series E+. Series A is the initial fundraising round, the proceeds from which are used for developing the product. Once the product is ready to be commercialized, the startup may raise to Series B for financing its commercialization and potentially a first internationalization to reach more markets. During this phase, the startup becomes more stable, but its revenues are still insufficient to cover its expenses. Therefore, it is still loss-making and showing a negative net profit. The startup would then raise to Series C to continue its growth,

leveraging on its first sales successes. The startup can later move on to Series D and E to finance specific projects, such as launching a new product, entering a new market, or acquiring a company. Many startups, however, aim at reaching breakeven and becoming financially self-sufficient to not need additional fundraising beyond Series C.[7]

This description of fundraising is very general based on the main market trends, and it surely cannot fit all startup companies. Looking at the selected sample for this article, table 1 shows which series the defense technology startups are in and how much they raised in total. The noteworthy item is the amount raised, which are all sizeable in the double-digit-million range, reaching €760 million EUR (approximately $875 million USD) for Hesling. The amounts were all raised in few rounds, which demonstrates the capacity of these startups to propose innovative solutions that match with and deliver on tactical military needs.

This section has presented key concepts that frame the startup ecosystem in general. Now, the article examines defense technology startups, starting with their business strategies.

How to Break through Military Innovation: Software-to-Hardware Strategy and Upgrade-instead-of-Replace Strategy

Entering the military equipment market requires a very well-thought-out strategy due to the inherent difficulties of the market. Well-established companies—Thales, Safran, Leonardo, Airbus, Rheinmetall, and Lockheed Martin, to name a few—already offer a wide range of technological solutions. An extremely high engineering level is needed to develop cutting- edge products. Finally, stringent security rules are necessary for military forces to

use the products on the battlefield. As a result, defense startups have wisely adopted a step-by-step development strategy that has them partner closely and as early as possible with the military forces as well as with the industrial market leaders.[8]

In this article's sample, Aeralis, Helsing, and Milrem Robotics opted for the software-to-hardware strategy. Each first developed a software tool, and once it was fully operational, they developed equipment that runs with that software tool. In the United Kingdom, Aeralis began with the development of software tools for air combat, which included a digital twin platform replicating a real aircraft and software that allows for an interchange between the aircraft's system components.[9] Once the software tools were developed, Aeralis kicked off the development of crewed and uncrewed aircraft using its software solutions. This project has been run in partnership with the British Royal Air Force, thereby securing a purchaser and making sure that the product can deliver on the purchaser's needs and requirements.

Moving to the European continent, Helsing first worked on developing a range of software tools, such as a targeting software able to fill the entire targeting chain (i.e., identification, localization, assignment, and engagement).[10] Furthermore, Helsing built two software tools for air combat: one for threat assessment and intent recognition and the other for flight simulation.[11] Helsing then moved to the production of airstrike drones with its air combat software tools built in.[12] Milrem Robotics' first product was a software tool able to run various operations autonomously (e.g., obstacle detection and avoidance, route exploration, etc.). In a second step, Milrem Robotics engaged in developing robot combat vehicles for mechanized infantry.[13]

Another strategy, which can also be complementary to the software-to-hardware strategy, is the upgrade-instead-of-replace strategy. The latter has framed the activities of two of the sampled start-ups: Helsing and ARX Robotics. This approach offers a clever way to bridge the gap between an existing traditional nondigitalized system and a future digital-first system. In addition, it also allows for a switch back to the traditional way of working in case information technology and electronics become inoperant on the battlefield due to either a successful enemy electronic warfare maneuver or simply by misfunctioning.[14]

The growing use of electronic countermeasures and enemy capabilities in the matter call for the imperative to be able to keep working and fighting without any electronic equipment. In essence, this demands maintenance of the traditional legacy material (landlines, etc.) and continuously training military personnel on fundamentals (use of a compass, map reading and navigation, elementary calculations, etc.).

Looking at the sample, Helsing created a software tool that collects data from sensors to be installed on military vehicles to create a live picture of the battlefield. This is a quick-win solution for forces to become digital without replacing their entire fleet of vehicles. In addition, this minimizes operational disruption since the forces can continue using the vehicles they are accustomed to. Finally, this is a lower-cost solution, which is useful when budgets are tight or when the technology is purchased in small quantities to supply only a few units.

ARX Robotics developed a solution along similar lines. It designed a software that, once installed on an existing fleet of vehicles, makes the fleet interconnected, synchronized, and operative in swarm.[15] This offers the same

benefits as Helsing's solutions, allowing the forces to move to a digital way of work while avoiding changing the whole fleet and profoundly disrupting the existing ways of working. Additionally, ARX Robotics' approach illustrates well the need for the forces to engage into connectivity and communication between all different types of vehicles as well as combatants on the battlefield, thereby securing an all-time coordination. Indeed, conducting a military operation involves integrating numerous unforeseen readjustments during the operation (change of route, reinforced reconnaissance capabilities, etc.). Such software tools can dramatically narrow the time needed to detect and analyze new parameters, as well as the time to organize a new setup to answer the new constrains. In that respect, the use of military software offers a decisive tactical advantage.

The sample shows that working with the software-to-hardware and upgrade-instead-of-replace strategies has been helpful in delivering on defense technology startups' sales objectives. This is underpinned by the orders placed by armed forces to purchase these solutions. However, these smart strategies alone are not sufficient for the startups to grow. To do so, the startups also need support from the well-established military equipment suppliers.

Disrupting and Piggybacking the Traditional Industrial Players: The Proposition of Defense Technology Startups to Their Sector

Disruption narrative is a recurring element in the startups' storytelling, as they like to place themselves at the forefront of an aging industry allegedly lagging behind technological progress. Such a narrative, however, would not be fair for the defense sector, whose main players have been significantly investing

in research and development to supply military forces with high-end technological products.

Indeed, national forces—the clients—come to their suppliers with specific national needs and technological requests. By doing so, they ultimately oblige the suppliers to keep up with technological advancements and their digitalization exigencies. As an example, the Lynx XM30 mechanized infantry combat vehicle, which is produced by Rheinmetall, is made exclusively for the U.S. armed forces and was developed with them to answer their needs as outlined by the U.S. Army's Next Generation Combat Vehicle program.[16] In addition, several national forces buy off-the-shelves products—that is, not specifically developed for them—and therefore suppliers need to offer state-of-the-art devices in their catalogue to attract clients.

Consequently, finding an innovation niche in the defense industry is uneasy, as established manufacturers have already engaged the full spectrum of military innovation, including uncrewed devices. Defense technology startups place themselves for the most part in the segment of software tools and uncrewed vehicles. Although this segment is already being served by larger companies, there is still room to accommodate new players.

The differentiating advantage of defense technology startups is to enter more adventurous research and development than that of the established players. Rapid prototyping is therefore the niche of the defense technology startups. That said, their capabilities are naturally constrained by their small size, such as a small team of engineers or a small budget. As a result, they need to partner with their industrial peers to piggyback off their engineering knowledge, testing facilities, production tools, and more.

All startups included in the sample have entered into partnerships with several larger industrial companies. For example, Helsing works with Airbus Defence and Space; Milrem works with Thales and Rheinmetall; Aeralis works with Siemens, Thales, Safran, Honeywell, and Rolls-Royce; and ARX Robotics partners with Renk.[17] One advantage of these partnerships to the large companies is that they can benefit from the startups' successful prototyping without bearing too much of the risk of failure.

Partnerships are not limited to grouping a large established company and a startup. There are also cases in which startups partner between themselves to create a synergy between their innovations. One example is the case of ARX Robotics and Helsing partnering to develop AI-based solutions.[18]

While the financial risk of partnerships is rather limited, some large companies move a step further and enter the capital of defense technology startups. By becoming a shareholder, the large companies act as venture capital entities and bear a risk on the success of the startups. This presents a financial move on top of, or perhaps more than, an industrial move. For example, Helsing counts Saab among its shareholders, with the latter holding a 5-percent share representing an initial investment of €75 million EUR (approximately $86.3 million USD).[19] In addition, Milrem has been partly owned by Krauss-Maffei Wegmann, a German tank manufacturer, which held a 24.9-percent ownership as of 2021.[20]

In conclusion, defense technology startups are interoperating very well within their industrial sector, and even from inception they are smartly navigating between disruption—more precisely, venture prototyping—and piggybacking on industrial capabilities. Moreover, defense technology

startups have found their business trajectory leveraging on the software-to-hardware strategy and/or upgrade-instead-of-replace strategy, as illustrated by the sample. That said, this does not exclude the fact that other startups pursue different strategies.

The primary goal for all startups, regardless of their sector, is to become an established company, even joining the club of the most successful ones. To achieve this, startups must deliver on their business models and growth promises while always keeping up with technology that evolves at the speed of light. In the case of defense technology startups, the turning point is the use of their products on the battlefield, which is conditioned by the acceptance and support of military forces and their governments.

The Instrumental Role of Defense Technology Startups in National and Allied Programs for Military Innovation

The second and last part of this article focuses on the interactions between defense technology startups and the public authorities. Because national and allied authorities want to accelerate military innovation, supporting all defense technology actors is essential to achieving this objective, which is ultimately a race against competitors.[21] The first section analyzes the collaboration between the armed forces and the defense technology startups from prototyping to the use on the battlefield. The second section examines the vital role played by the national and allied authorities in financing military innovation.

From Training Camps to the Front Line: The Involvement of Forces in Developing New Technological Gems

Most military forces have a clear roadmap for digitalizing their ways of fighting, which refers to the numerous rewards that the use of software and uncrewed vehicles can bring on the battlefield. The use of such devices allows for endless surveillance and reconnaissance, facilitates accurate target identification and engagement, and dramatically decreases death risk for friendly forces. Consequently, forces are very much looking at military innovation, and they actively engage with companies to support their innovation projects. When engaging with traditional suppliers, forces enter traditional contracts whose main clause mostly involves the commitment of large orders, as exemplified earlier by the agreement between Rheinmetall and the U.S. military.[22]

Military forces have a unique approach toward defense startups that can certainly not replicate the kind of deals agreed with market leaders. Instead, the forces have adopted a more caring and encouraging approach, extending access to their exercises and training facilities for defense technology startups to test their products with military personnel. This share of expertise and means is often offered for free or at a very low price. However, this should not be confused with charity, since military forces obviously have an interest in the success of defense technology startups. The deal sounds fair: startups can use military capabilities for free, and forces will buy their products afterward if they turn out to be fieldable. For startups, this arrangement alleviates research and development costs and secures a sales opportunity.

Looking at the sample, the German armed forces (*Bundeswehr*) have played an instrumental role in the development of ARX Robotics and Helsing. Collaboration began with the Bundeswehr allowing the startups to test their products together with German military personnel during exercises, thereby also training the personnel to use new technological devices.[23] Once fieldable, the Bundeswehr purchased the products to use them during deployments, including on NATO's eastern flank.[24] In addition to national support programs, and there are also allied programs essentially sponsored by NATO or the EU. For example, ARX Robotics benefited together with other European defense technology startups from the knowledge of the Italian armed forces under the European Defence Agency's EU Defence Innovation Operational Experimentation (OPEX) campaign.[25] This program provides startups with access to military expertise and facilities to test and develop uncrewed aerial systems and uncrewed ground systems.

Ultimately, the major turning point for defense technology startups is the use of their products on the battlefield, which validates the viability and expediency of their solutions. Several sampled startups have already reached this milestone. The Ukrainian armed forces are now using equipment by both ARX Robotics (uncrewed ground vehicles) and Helsing (strike drones).[26] Furthermore, Milrem has achieved the largest track record as its solutions are being used by 19 countries, including 9 NATO countries and Ukraine. Milrem products have been used in several instances on battlefields, namely by the Estonian armed forces during Operation Barkhane (2014–22), and by the Ukrainian armed forces in the Russo-Ukrainian War.[27]

Consequently, the armed forces are an essential partner for the defense technology startups, which are in turnkey players in the acceleration

of military innovation and digitalization. Research, development, and prototyping come with a cost—often a high one—which can be alleviated to a certain extent by the support of the armed forces and partnerships with the established players. Ultimately, defense technology startups must secure access to funding, and national defense departments, NATO, and the EU are injecting cash into them.

The Acceleration in National and Allied Efforts for Funding Military Innovation, and a Gap between the EU and the United States

Securing access to funding is a core concern of all startups. They are frequently in need of new fundraising, roughly every two to three years. This involves approaching existing and new investors to present achievements and projects and to ask for cash invested most of the time in form of new equity. As described earlier, such investments bear a meaningful risk, because the startups are typically unprofitable—that is, the net profit is negative—and engaged in hazardous technological projects. In short, investors have no hard guarantees that the startups will become successful. A cease of activities or a fire sale (a sale at a low price to another company or bigger startup) would mean a loss on their investment.

In this environment, defense technology startups face an unusual situation. Like any other startup, they can reach out to private investors, who are often specialized in startups and invest across various verticals (a synonym for *sector* in the startup ecosystem). Typically, the capital table of a startup (the list of its shareholders) would include a mix of private investors, the founders, and sometimes family offices. This is where the situation of defense technology startups gets complicated, because many investors are

reluctant to deal with defense due to reputational and governance concerns.[28] That being said, this stance has been evolving since 2022 and the rise of the Russian threat to NATO. A recent milestone underpinning this shift was the launch in 2025 by Euronext of new indices to cover defense, a training program for defense companies to an initial public offering (IPO), as well as a segment for the European defense bond.[29]

This situation is specific to Europe, as defense has never been as sensible a topic in the United States, where investing in defense is not an issue, at least not in the European sense. This difference can be seen clearly in fundraising achievements. For a better illustration, table 2 restates the information given in table 1, ranks it by fundraising size from largest to smallest, and adds a sample of U.S. defense startups for comparison.

Table 2. Defense technology startups by fundraising levels

Startup	Creation	Incorporation	Product	Current series	Total of fundraisings
Anduril	2017	United States	Drones (air)	G	$6.26 billion USD
Shield AI	2015	United States	Drones (air)	F	$1.17 billion USD
Saronic	2022	United States	Drones (sea)	C	$830 million USD
Helsing	2021	Germany	Drones (air)	C	€760 million EUR (approximately $875 million USD)
ARX Robotics	2023	Germany	Drones (land)	A	€41 million EUR (approximately $47.2 million USD)
Milrem	2013	Estonia	Drones (land)	A	€38 million EUR (approximately $43.7 million USD)
Aeralis	Early 2010s	United Kingdom	Drones (air)	N/A	$16.8 million USD

Source: courtesy of the author.

Although the U.S. startups listed here are somewhat older than the European ones, the size of their fundraising is clearly on another scale. This

difference is for the most driven by the greater appetite of U.S. investors for defense, as well as their higher inclination to take investment risks. For the rest, U.S. defense technology startups evolve in an environment similar to European ones, which includes partnerships with established players (such as Lockheed Martin and Anduril) and access to U.S. military facilities for training and testing (e.g., the "valley of death" in military acquisition).[30]

Although European defense technology startups have difficult access to private investors, they do have reserved access to public investors. Indeed, national governments, the EU, and NATO have designed dedicated funds and budget lines for financing military innovation. From that perspective, defense technology startups can be seen as privileged over other startups, which must compete and line up to access investors. Looking at the EU alone, the funds earmarked for military innovation are significant: €8 billion EUR (approximately $9.2 billion USD) from the European Defence Fund, another €8 billion EUR jointly from the European Investment Bank and the European Defence Fund, and €800 billion EUR (approximately $920 billion USD) from the ReArm Europe initiative.[31] As a result, there are plenty of good chances for all defense start-ups to access these funds. Returning to the sample for illustration purposes, Milrem received meaningful support from the EU and its member states, with €32.6 million EUR (approximately $37.5 million USD) earmarked for its research and development on uncrewed ground systems.[32]

As stated above, the U.S. defense technology startups have easier access to private investors. However, this does not stop the U.S. government from extending funding for military innovation. For example, yearly budgets of approximately $830 billion USD have been allocated to military innovation.[33] Moreover, the U.S. Department of Defense's Defense

Innovation Unit provides defense technology startups with support for prototyping.[34] This can be seen as an indirect financing solution, insofar as it does not inject cash directly in the startups but offers free access to facilities and expertise that would otherwise come with a cost.

NATO is equally active in sponsoring and financing the defense technology ecosystem, especially through the NATO Innovation Fund and the Defence Innovation Accelerator for the North Atlantic (DIANA). The former is a €1 billion EUR (approximately $1.2 billion USD) venture capital fund that invests in deep technology for defense, security, and resilience.[35] The NATO Innovation Fund has invested in ARX Robotics.[36] The latter is an accelerator, which means that it is a center where startups can access mentoring by experts.[37] DIANA is comparable with the U.S. Defense Innovation Unit and offers the same indirect cost-saving rewards.

Finally, to close the discussion about public financing, some defense technology startups benefit from foreign and outside-of-NATO financing. In the sample, this is the case with both Aeralis (with £10.5 million funding from an undisclosed Middle Eastern sovereign wealth fund) and Milrem (with the majority owned by a United Arab Emirates fund since 2023).[38] This is consistent with the well-known appetite of Middle Eastern governments for state-of-the-art military equipment. According to research conducted by the NATO Innovation Fund, defense technology startups primarily attract domestic investors or investors based in NATO countries, and the presence of outside-of-NATO investors remains a minority, although this is very much fluctuating with, for example, a 7-percent share in the 2024 fundraisings and an all-time-high peak of 29 percent reached in 2019.[39]

Alongside fundraising, another source of financing for defense technology startups is sales. As discussed in the first part of this article, startups are not assumed to be forever loss-making and dependent on fundraising. Fundraising rounds are conducted in the early stages of the company and until breakeven is reached. The objective of any startup is to become independent, with revenues covering all costs and generating profit. Clients of defense companies are normally governments that place orders to supply their national military forces, and sometimes allied forces in the case of providing support to another country, such as NATO nations helping Ukraine since 2022. To diversify their clients base, a common strategy of defense companies is to engage in dual use. In essence, this involves reconfiguring military equipment for a civilian use so nonmilitary customers can purchase it as well. Two of the sampled startups have a dual-use strategy. ARX Robotics and Milrem sell a civilian version of their uncrewed vehicles, which can be relevant for logistics companies, among other businesses.[40]

To conclude, defense technology startups are playing a significant role in military innovation, primarily for developing uncrewed vehicles and software tools. This statement should not, however, dismiss or decrease the role played by established defense companies, which are all engaged in cutting-edge technological programs. National and allied authorities are resolutely supporting the defense technology sector by actively involving the forces in testing and prototyping and by extending significant financing. The rewards of this strategy are already tangible with the use of startups' products in zones of operations.

Conclusion

While the contribution of defense technology startups to the economy is still in the making, this article draws an early assessment of the rewards of these startups for military innovation. The entities best placed for an appraisal are eventually the forces themselves, who are the end users. Their strong interest and support to defense technology startups highlight their interest in betting on multiple and diverse innovation players for securing access to new technological products. With that perspective, defense technology startups increase economic diversification and push competition for engaging in advanced technological research. Indeed, startups are usually early adopters of emerging technologies. By collaborating with them, forces can make sure to keep up with state-of-the-art technology, to evaluate the rewards of each novelty toward their needs, and to encourage prototyping whenever a solution seems to be fieldable.

On their side, defense technology startups have wisely placed themselves within the defense sector to deliver on their promises to commercialize high-end technological products. As examined here, defense technology startups closely collaborate with established military equipment suppliers, piggybacking on their expertise and production capabilities. They develop business strategies that allow them to sell upgrade solutions and civilian applications alongside their core offer of expensive and complex technological products. Of course, all of this is possible, or at the very least greatly facilitated, by the meaningful financial support of national and allied authorities that run numerous programs for steering military innovation.

Finally, the ethics of war were not covered in this article, nor was the legitimacy of adding more technology on the battlefield, as the focus was on

an industrial analysis of the defense technology sector. However, there should be no ambiguity that the author is very well aware of the atrocities of war, which is forever nothing but, to quote William Shakespeare's *Macbeth*, "a tale . . . Told by an idiot, full of sound and fury . . . Signifying nothing."[41]

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[1] Michael Newton, "How Are Drones Changing War?: The Future of the Battlefield," Center for European Policy Analysis, 3 November 2025; Jan Joel Andersson and Sascha Simon, "Minding the Drone Gap: Drone Warfare and the EU," European Union Institute for Security Studies, 11 October 2024; Eric Schmidt and Will Roper, "Ukraine Shows How Drones Are Changing Warfare," *Time*, 28 September 2023; "How Israel Is Using Drones in Gaza," *Economist*, 4 December 2023; and Andie Parry et al., "Iran Update Special Report, June 14, 2025, Morning Edition," Institute for the Study of War, 14 June 2025.

[2] Jan Sliwa, "Internet of Military Things and Weaponized AI," in *Internet of Things A to Z: Technologies and Applications*, 2d ed., ed. Qusay F. Hassan (New York: Institute of Electrical and Electronics Engineers, 2025), 465–94, https://doi.org/10.1002/9781394280490.ch19.

[3] This is a wording precaution to avoid engaging in a computer scientist debate on whether AI already exists, using, among others, the Turing test, which was proposed by English mathematician Alan M. Turing in 1950 to determine whether a computer can think equivalent to a human. See Melanie Mitchell, "The Turing Test and Our Shifting Conceptions of Intelligence," *Science* 385, no. 6710 (2024), https://doi.org/10.1126/science.adq9356.

[4] Barbara Bigliardi et al., "The Role of Digitalization in Startups: A Keyword-based Literature Review," *Procedia Computer Science* 253 (2025): 2665–73, https://doi.org/10.1016/j.procs.2025.01.326.

[5] Yves Remmler, "Series A and Beyond: Essential Lessons for Founders Entering the Growth Phase" *Forbes*, 7 April 2025.

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