



Prepared By Cypris Team In the Aerospace & Defense (A&D) industry, key players are swiftly adopting generative AI, extending its application beyond autonomous aircraft to include routine operations, data analysis, optimization of fleet, image and signal planning, and cybersecurity. Notably, the U.S. Department of Defense (DoD) has emerged as a pivotal player in this evolution, allocating substantial funds to harness the potential of AI in defense systems.



Integrating AI into operations is becoming a strategic initiative for major players in the aerospace and defense industry. For example, major defense contractors such as Raytheon, General Dynamics, and Northrop Grumman have announced AI initiatives in recent years. VC arms of companies such as Airbus and Boeing have made investments in AI startups. Additionally, AI-powered A&D startups continue to raise large rounds of funding and gain traction within the U.S. military.

In this report, we'll examine aggregated data and unique, GPT-powered insights from Cypris' Innovation Dashboard to get a deeper understanding of how AI is transforming the aerospace and defense space. We assess the following data points:



drivers of AI progress in A&D





Market outlook and IP trends driving AI usage in A&D



Spotlight on startups: innovative A&D startups utilizing Al

Federal Government Financing – Driver of Al Progress in A&D

The DoD is investing billions of dollars to develop and integrate AI into its defense systems. Other nations, such as Russia and China, are making significant investments in AI technology for national security purposes. In the 2024 defense spending bill, the DoD requested \$1.8 billion for AI and machine learning and has communicated its goal to integrate AI into all military functions. The DoD also requested \$1.4 billion for its Joint All-Domain Command and Control Initiatives, which aim to create an AI network of connected sensors across all military branches.

In 2017, the DoD announced Project Maven, an initiative to apply computer vision technology for military purposes. Project Maven sought a partnership with Google to use the company's AI technology to analyze drone intelligence footage and use computer vision for drones to detect objects from above. The DoD also launched the Joint Artificial Intelligence Center (JAIC) in 2018, an organization focused on accelerating the adoption and integration of artificial intelligence across military services.

In February 2020, the DoD officially announced the adoption of ethical principles for the use of Artificial Intelligence after recommendations by the Defense Innovation Board. The Principles apply to both combat and non-combat functionals. According to the principles, DoD AI capabilities must be responsible, equitable, traceable, reliable, and governable. The JAIC has worked alongside experts from across the DoD to operationalize these principles. Initiatives include establishing a DoD-wide Responsible AI subcommittee and releasing a DoD Workforce AI Education strategy to train an AI-ready workforce.

Figure 1: DoD Principles of Artificial Intelligence Ethics



Al in A&D: Market Trends and IP Insights

Al has already gained significant traction within aerospace and defense. Mordor Intelligence values the Al in A&D market to be about \$29.7 billion and forecasts a valuation of more than \$42 billion by 2028. Cypris' Al insights find that patients filed in the Al & defense market have been, as a whole, growing over the last 5 years, with a 42.28% average growth rate, in accordance with increasing government and private spending.



training, environmental sensing abilities for aircraft, and predictive maintenance. Other areas of focus include device analytics, radar systems, aviation emergency rescue systems, and artificial intelligencebased meteorological support systems. These patents indicate a growing focus on integrating artificial intelligence into various aspects of aviation for improved safety, efficiency, and reliability.

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AI & Aviation

Al's Influence on Aerospace and Defense: Exploring Transformative Impacts



Autonomous Aircraft:

A key use of AI is in powering autonomous aircraft. Key components of AI in autonomous aircraft include computer vision systems and employing AI in sensors that monitor necessary flight data including wind, weather, and air traffic. Self-flying air taxis, or eVTOLs, are a popular concept that has spurred several startups and investments from the U.S. Air Force. A key player is Aurora Flight Sciences, a Virginia-based research subsidiary of Boeing that focuses on special purposes unmanned aircraft. These systems, such as unmanned aerial vehicles (UAVs) or autonomous underwater vehicles (AUVs), can perform tasks that are deemed too dangerous or difficult for human operators.



Flight Planning and Operations:

Generative AI has made significant strides in flight planning and operations. By using machine learning models, airlines are now able to optimize flight paths, taking into account factors such as weather conditions, airspace congestion, and fuel consumption. For example, Airbus uses Skywise, a data platform powered by AI, to optimize flight paths and reduce fuel consumption. This not only maximizes operational efficiency but also increases sustainability.

Image and Signal Processing:

The aerospace and defense industry has several use cases for advanced image and signal processing capabilities powered by AI. In the defense sector, AI-driven image processing is critical for threat detection and mitigation. Traditional surveillance systems often rely on human operators to identify potential threats, but AI can automate this process, scanning through thousands of images much more quickly than a human could, and with fewer errors. Some systems can even predict potential threats or hostile activities based on pattern recognition in the data. Signal processing, on the other hand, is used to detect and decipher coded communications or signals from foreign entities, providing valuable intelligence in real time.

Al not only detects potential threats but also responds to them in real time. Neural networks, a subset of Al, have been particularly effective in identifying anomalies and suspicious activities. In the aerospace sector, Al-driven systems play a crucial role in ensuring the cybersecurity of unmanned aerial systems (UAS), or drones. Drones are prone to cyber-attacks, which can disrupt their operation or even hijack control of their operations. To tackle this, companies like Dedrone have created Al-powered threat detection systems, which continuously monitor the airspace and identify potential threats, ensuring the safe operation of drones. Al is instrumental in securing the command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) systems from cyber-attacks. For example, Al technologies have been embedded into the cybersecurity strategies of the U.S. Department of Defense. These Al-driven systems are capable of detecting abnormal behaviors in the network, flagging potential threats, and even forecasting future attacks based on existing patterns.

Simulation and Training:

Cybersecurity:

The use of virtual reality (VR) and augmented reality (AR) platforms for training pilots and engineers is increasing rapidly. Al is used to create realistic training simulations for pilots and defense personnel, by using Al-enabled simulators in conjunction with virtual reality systems. The simulators can also use biometric sensor data to predict individual performance. For example, the U.S. Air Force has been able to reduce costs while training its pilots faster in its Pilot Training Next Initiative program. This is done by providing commercial virtual reality (VR) headsets and Al-powered intelligent tutors. A single large-scale live flight training can cost millions of dollars - the use of Al has the potential to dramatically reduce training costs. The Pilot Training Next Initiative program has had impressive results, in some cases, cutting the time needed to train pilots in half.

Al–Centric Startups and Their Impact on Aerospace and Defense

According to Pitchbook Data, Defense technology investment and acquisitions were robust from 2016 to 2022, with a total of \$135.3 billion invested and 71.0% of VC exits as acquisitions. Areas such as drones, cybersecurity, and artificial intelligence have been at the forefront of the investment wave.





Key Startups Revolutionizing Al Use in A&D:

🔅 SHIELD AI

Shield AI is a cutting-edge technology company that specializes in developing AI solutions for the aerospace and defense industry, developing Al-powered fighter pilots, drones, and technology for defense operations. Shield AI developed Nova, its autonomous drone, and Hivemind, its software platform, in 2015. Shield Al's small unmanned aircraft system (sUAS) was the first AI-powered drone to be applied for defense purposes in U.S. military history. Nova has important military applications. For example, when used in combat, the drone can enter an enemy building and send photos and maps to a unit of soldiers to help them navigate. ShieldAI has also been involved in Al-powered eVTOL (or electronic vertical takeoff and landing aircraft)

Founded in 2017, Anduril Industries is a technology company that aims to revolutionize the fields of aerospace and defense through the use of artificial intelligence (AI). Anduril makes defense hardware and software, including drones and surveillance towers that connect to a shared software platform called Lattice OS, an operating system for defense. Using technologies like computer vision, sensor fusion, and AI, Anduril markets its products as a way to monitor military bases and borders. Anduril is moving beyond surveillance - the company recently signed a military contract to deploy interceptor drones, or drones that destroy enemy drones, overseas in conflict zones.

Q Palantir

Palantir Technologies is a data analysis software company founded in 2003. Palantir self-describes as operating like a scrappy startup with the resources of a larger technology company. The Company announced the launch of its Artificial Intelligence Program (AIP) in April 2023 for both government and private clients. The platform combines the capabilities of large language models (LLMs) Like OpenAl's GPT-4 or Google's BERT with proprietary software to enable a secure and responsible platform for both enterprise and government customers. Palantir provided a military application in its demo video for the product with a scenario involving enemy forces penetrating the country's border. The AIP software assessed the situation and proposed strategic courses of action. The company's primary software platforms, Gotham and Foundry, have been used by military intelligence agencies and defense organizations.

The Al Shift: Transforming Aerospace and Defense

The aerospace and defense industry is undergoing a significant transformation through AI adoption. Major players in the industry, including defense contractors and startups, are actively integrating AI into various aspects of their operations. The U.S. Department of Defense is a key driver, investing billions of dollars to develop and integrate AI into defense systems.

Key areas where AI is making a significant impact include autonomous aircraft, flight planning and operations, image and signal processing, cybersecurity, and simulation/training. AI is enhancing safety, efficiency, and reliability in aviation, with applications ranging from optimizing flight paths to automating threat detection and response in defense operations. The rise of substantial venture capital funding of AI-centric startups in the A&D sector, such as ShieldAI, Anduril, and Palantir, highlights the industry's drive to innovate.



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