

Artificial intelligence in operational technology

Sector focus: Aerospace and defense

The aerospace and defense industries rely on high precision and complex, lengthy manufacturing processes involving thousands of suppliers in a highly regulated industry. To meet these challenges, companies are digitizing their OT environments and looking at optimization opportunities with AI.

After some years of turmoil, the aerospace and defense industries are in a strong position. Demand for air travel continues to grow, and defense spending is increasing in this age of geopolitical upheaval. However, they continue to face a range of complex business challenges, including a continuing focus on safety, supply chain disruptions, talent shortages, sustainability requirements, complex regulations and long development cycles.

Meeting challenges with AI in OT

Technology can help meet these challenges, and AI deployed in OT promises to help improve product quality and process efficiency. Increasing the resilience of production is vital in all industries, and AI can help reduce unplanned downtime and mitigate the impact of any supply chain disruption. AI plays a key role in ensuring the quality of products and machine learning can help optimize processes throughout the long manufacturing cycle.

The first step in bringing AI into the OT environment is to integrate IT and OT systems. This is already happening widely. In our manufacturing survey carried out by GlobalData, aerospace and defense manufacturers reported some of the highest levels of IT/OT integration, with 91% of respondents having made significant progress with full or partial integration.

Rapid progress in AI/GenAI

Our survey also found that AI/ML is already deployed in aerospace and defense manufacturing OT environments by 39% of our respondents, with a further 50% reporting pilot projects or plans to deploy the technology within the next 12 months. In addition, around 62% of aerospace and defense manufacturers have deployed or are piloting GenAI, with just 10% of respondents having no GenAI plans.

This push towards AI in OT is backed by the aerospace and defense C-suite, with 58% of executives saying it is either “essential” or “very important”. Like most other sectors, this initiative is being led by the IT department as part of an IT/OT convergence strategy.

AI in OT benefits

In terms of identified AI benefits, the top three chosen by aerospace and defense executives in our survey are improved productivity, improved product quality and greater efficiency. With manufacturing becoming ever more complex, improving processes and productivity are critical, along with ensuring the quality of products produced.



AI in OT use cases

The aerospace and defense industry is deploying a wide range of AI and GenAI use cases in manufacturing across the board. We look at three of the most popular: manufacturing efficiency, supply chain management, and quality control.

Manufacturing efficiency

The aerospace industry produces extremely complex products: the Boeing 787, for example, has over 2 million parts sourced from a global supply chain. Aircraft manufacturing produces large quantities of data and there are many opportunities to use AI to improve manufacturing process quality, reliability and efficiency. For example, Boeing has worked with the AI Institute in Dynamic Systems to develop an algorithm to reduce the measurements required for precision aircraft assembly and streamline the manufacturing process. It is currently used in production on the 777X and 787.¹

Supply chain management

A typical commercial aerospace original equipment manufacturer (OEM) has more than 200 tier 1 suppliers and 12,000 tier 2 or tier 3 suppliers, according to Deloitte². With this complexity, supply chain issues, such as securing materials or delayed component deliveries, can seriously impact manufacturing schedules. AI can play several roles here, such as tracking parts and materials across the supply chain, predictive analytics to anticipate disruptions and proactively identify alternative sourcing strategies, and balancing stock levels to avoid overproduction or shortages. For example, one aerospace OEM used analytics to identify common markers of future supply chain disruption, such as frequency in purchase order changes, which allowed it to reduce component shortages by 25%.³

Quality control

AI-powered autonomous systems can help the aerospace industry improve the ease, efficiency, and reliability with which their products can be manufactured at scale while meeting quality, cost, and schedule requirements. For example, Boeing uses cameras and robotics to automate manufacturing inspections and yield more consistent results. Teams use technology to analyze manufacturing data, while machine learning analyzes data from fabrication tools. These technologies spot degradation much earlier, resulting in tighter manufacturing tolerances that enhance safety and quality.⁴

Overcoming AI challenges

Aerospace and defense executives have identified several challenges holding back the broader adoption of AI within the OT environment. The top three were regulatory compliance, the ability to monitor real-time data and insufficient data quality. Regulation is a particular issue for defense companies that need to ensure components meet export control requirements in any dynamic optimization of the supply chain.

To help them overcome these issues many aerospace and defense manufacturers are turning to third-party assistance. The survey found that help was sought across the board, with the three most popular requests for assistance being establishing responsible AI best practices, improving data management and advice on understanding the regulatory environment, which aligns closely with the challenges that the industry identified.



Focus on digital infrastructure

Digital infrastructure plays a key role in enabling AI in OT projects, with foundational technologies such as networks, cloud and security helping drive the convergence of IT and OT. Our survey found that 86% of aerospace and defense respondents in our survey said they had the requisite IT infrastructure fully or partially in place for deploying AI in OT. Concerns over cloud connectivity and cybersecurity dominated among those who didn't.

These worries are shared with many other industries. Manufacturers are increasingly the target of cyberattacks, which can shut down operations or steal business-critical information – and targeting defense industries is a prime motivation for state actors trying to gain a military advantage. Downtime is so damaging to business that ensuring resilience is essential. As such, upgrading OT security is an investment priority for 65% of our aerospace and defense respondents as part of the push to AI on OT.

Connectivity is vital for the success of AI in OT because the processing of data is largely carried out in the cloud. However, the aerospace and defense industry is increasingly looking to edge computing to bring processing closer to the factory, with 67% of respondents either using it or planning to use it within 12 months as part of their IT/OT strategy.

Why Orange Business

Orange Business can help you make the most of these AI opportunities, and support you in your data quality, integration and infrastructure requirements.

We have a unique skill set as a global integrator, communications operator and service provider, along with genuine experience of the industrial world. Our individual approach is designed to make your business outcomes a reality. Our consultants have extensive aerospace and defense industry experience and are supported by best-in-class partner ecosystems.

We can answer your transformation challenges at every stage of the data journey using a secure, scalable, flexible approach. With our business approach, methodology, and skills, we will work closely with you to outline business goals, organize efficient and secure data sharing, and accelerate innovation.

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1. <https://dynamicsai.org/industry/boeing/>
2. <https://www.deloitte.com/us/en/insights/industry/aerospace-defense/aerospace-and-defense-industry-outlook.html>
3. <https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/addressing-continued-turbulence-the-commercial-aerospace-supply-chain>
4. <https://www.boeing.com/content/dam/boeing/boeingdotcom/features/innovation-quarterly/2024/iq-2024-q3-todd-citron-tech-that-connects.pdf>

