

The Avathon Autonomy Platform

World-Class Performance in Aerospace Operations

A globe-spanning network of aerospace assets

There are around 152 different master series of civil aircraft operating in the world today, produced by 26 different manufacturers. These fall into four major categories, i.e., widebody (777, A350), narrowbody (737, A320), regional (Embraer, A220), and turboprop (ATR 72). In addition, there are hundreds of avionics and aircraft system/subsystem manufacturers building everything from jet engines to avionics systems to tires and batteries. The vast global network of airlines; manufacturers; lessor/operators; and maintenance, repair, and overhaul (MRO) organizations supporting these immense fleets is continuously challenged to maintain and operate current and aging aircraft while completing complex repairs in a highly regulated environment.

The aerospace/aviation industry faces relentless operating and cost pressures. Manufacturers must scale production while simultaneously innovating new products and meeting uncompromising quality standards. Supply chain managers are forced to deal with diminishing manufacturing sources and material shortages, long lead times, and geopolitical or trade-driven sourcing constraints.

Add to these challenges the technician shortages, retirements, and continuous training necessitated by rapidly evolving technology and you have a recipe for critical gaps in knowledge and staff availability on manufacturing, operations, and maintenance teams, threatening delivery schedules, asset availability, financial performance, and even product quality.

The Numbers Behind Aerospace Operations

152

Civil aircraft master series operating worldwide

26

Manufacturers producing those aircraft

4

Major aircraft categories —
widebody, narrowbody, regional, turboprop

100 +

Avionics and subsystem manufacturers

5–10 Yrs

Average component lifecycle / turnover

3 Major Segments

Airlines / Manufacturers / MRO organizations —
all interconnected in the aerospace value chain

The civil aerospace industry faces a wide range of unique challenges

The civil aerospace manufacturing and maintenance industry faces a unique set of challenges driven by the need for unwavering safety, efficiency, cost performance, and regulatory adherence. These challenges fall into four major areas:

1

Supply Chain Complexity

The global nature of aerospace manufacturing and maintenance makes the supply chain highly susceptible to disruption and inefficiency.

Weakened Supply Chains: Geopolitical uncertainty, scarcity of raw materials (e.g., titanium, aluminum, and rare earth minerals), and logistical bottlenecks can lead to parts shortages and significant aircraft delivery delays for manufacturers, and extended maintenance turnaround times for MRO providers.

Inventory Management: The huge variety and extensive lifespan of aircraft models (there are 737s in service that are more than 50 years old) require managing vast, complex parts inventories, some of which are becoming increasingly scarce for aging platforms. This increases costs and demands advanced maintenance planning.

Counterfeit Parts: The complexity and global reach of the supply chain increases the risk of counterfeit or substandard parts entering the maintenance system, resulting in potentially severe safety and compliance risks.

2

Workforce Shortages and Skills Gaps

There is a significant gap between the aerospace industry's need for specialized talent and the availability of trained workers.

Aging Workforce and Retirements: A large number of experienced technicians, engineers, and manufacturing specialists are retiring, leading to a critical loss of institutional knowledge that is difficult to replace. Boeing projects 710,000 new maintenance technicians will be needed globally over the next 20 years—with the North American market alone requiring an additional 123,000.

Skills Gap: The rapid introduction of new, advanced technologies in aircraft manufacturing (e.g., composite materials, sophisticated avionics) requires specialized expertise. This creates a skills mismatch, as the available workforce often lacks the training needed for modern maintenance and high-tech manufacturing processes.

Talent Pipeline: Attracting, training, and retaining new qualified talent to the technically demanding and highly regulated sector remains a daunting challenge.

3

Regulatory and Quality Compliance

Given the high-stakes nature of air travel, zero-defect standards and rigorous regulatory compliance are critically important, driving enormous complexity and cost:

Stringent Quality Requirements: Both manufacturing and MRO must adhere to strict quality control regulations (e.g., AS9100/10/20) and ensure complete traceability of every component, from raw material to installation.

Evolving Regulatory Landscape: Regulations set by bodies like the Federal Aviation Administration (FAA) and the European Union Aviation Safety Agency (EASA) are continually updated, requiring ongoing investments in training, documentation, and process changes to maintain compliance across multiple international jurisdictions.

Certification Timeframes: The certification of new aircraft, components, and repair processes involves extensive testing, documentation, and regulatory review, leading to long development and service entry cycles.

4

Cost Pressures and Technological Integration

The industry operates with thin margins but requires immense capital expenditures.

Escalating Costs: Rising prices for raw materials, spare parts, and labor (due to shortages and expanding training requirements) exert significant pressure on operating margins for both manufacturers and MRO facilities.

Aged Fleet Maintenance: While newer aircraft can be more fuel-efficient, maintaining aging fleets often involves increasing frequency of repair and reliance on more expensive, specialized, or custom-made parts.

Digital Transformation and Cybersecurity: The shift toward advanced manufacturing techniques, predictive maintenance, and digital operations requires massive investment in new technology (AI, big data, etc.). This increasing reliance on cutting-edge technological systems makes the industry a prime target for cybersecurity threats, requiring robust and costly defensive measures to protect sensitive data and operational integrity.

These challenges demand an integrated solution with wide ranging capabilities

Given this complex array of interrelated challenges, manufacturers, operators, and maintenance organizations need access to a support system that delivers a wide range of capabilities.

Predictive/Prescriptive Maintenance

- Identify part/system degradation before failures occur
- Pinpoint root causes of problems
- Generate recommended repair actions based on technician skillsets, operating schedules, parts availability, and financial impact
- Plan and optimize parts and consumables, workers, and supporting logistics with agility for rapid responses to disruptions

Autonomous Supply & Quality Assurance

- Forecast part/system demand
- Assess supplier capacity and identify alternatives when conflicts arise
- Inspect and detect anomalies in part quality or delivery dates/times
- Continuously monitor material provenance, supplier performance, and geopolitical or tariff impacts to prevent costly disruptions and ensure compliance

Workforce Augmentation

- Bridge the growing technician gap with AI-guided diagnostics and process automation
- Create contextual digital operating twins and provide just-in-time documentation to technicians and engineers
- Capture and codify institutional knowledge from senior staff and retiring experts to accelerate the learning curve for new team members

Logistics and Fleet Planning

- Dynamically optimize logistics and fleet schedules based on crew availability, weather, locations, and other variables
- Enable rapid response to unplanned maintenance with real-time parts availability and fleet/schedule optimization
- Coordinate delivery of critical parts or crewmembers to aircraft grounded in remote locations

Network Repair

- Recover from grounded aircraft events quickly and efficiently by coordinating parts, people, and repair actions across the global network
- Evaluate options such as parts cannibalization, local inventory pulls, or supplier expedites to restore aircraft to service and minimize disruptions and cost

Safety, Compliance, and Trust

- Deliver diagnostic, forecast, and prescription information that is fully explainable, transparent, and auditable
- Provide audit trail support based on aerospace compliance standards, e.g., AS9100/10/20, DO-178C, and FAA/EASA maintenance requirements, giving engineers and regulators confidence in each recommendation, decision, and action

The solution – Avathon Autonomy for Aerospace Operations

Avathon Autonomy for Aerospace Operations is a unified artificial intelligence (AI) platform that integrates supply chain, manufacturing, and maintenance data to facilitate coordinated decision-making and actions throughout the full aerospace lifecycle. The Autonomy platform uses AI to turn aerospace complexity into operational advantage and flight readiness—connecting manufacturing, maintenance, and supply chain data to address resource constraints, quality challenges, and parts availability, whether in production or in-service fleets.

The Autonomy platform leverages inputs from quality analysis, Bills of Materials (BOM), supplier sourcing, parts availability, and workforce skills/capacity to empower aerospace organizations to optimize their manufacturing and logistics processes with in-service maintenance and repair operations—reducing aircraft grounding events, improving throughput and quality, and ensuring fleet readiness.

But achieving these outcomes requires autonomy—a system that can reason, decide, and act across globally dispersed manufacturing facilities, maintenance hubs, and supply chains in real time. The Avathon Autonomy platform converts data from manufacturing, supply, and in-service operations into knowledge that autonomous agents act on in real time.

Case studies—Autonomy for aerospace in the real world

In recent work for a major international aerospace systems firm, Avathon utilized its Autonomy platform to enhance the organization's MRO operations, spanning several major areas of activity:

- **Improving Commercial Aviation Service Time:** The company selected Avathon's Autonomy platform to increase throughput and reduce the turn-around-time (TAT) of its MRO operations.
- **Enhancing Aftermarket Servicing at Scale:** Avathon's platform helps the company integrate machine learning into its processes to accelerate productivity in aftermarket servicing.
- **Prescriptive and Predictive Maintenance:** Avathon's Autonomy platform prescribes accurate maintenance actions, predicts failures for capital-intensive assets, and improves management of the supply network against logistics and obsolescence issues, which helps keep aging aircraft infrastructure operational.
- **AI-Powered Troubleshooting:** AI technology assists test engineers by providing recommendations on repair actions for failures observed on aftermarket products.



In addition, Avathon partnered with a major civil aircraft manufacturer using CKG technology to ingest, correlate, and process massive amounts of data from various, previously siloed operational systems across the enterprise.

- **Purpose and Challenge Addressed:** The principal goal was to provide a single, intelligent platform that could answer complex, domain-specific technical questions for thousands of company employees in real time, addressing the challenges associated with:
 - **Data Silos:** Consolidating data from dozens of different systems (e.g., engineering, procurement, logistics, and manufacturing).
 - **Time and Cost Reduction:** Reducing the time engineers and technicians spend searching for critical information.
- **Measurable Results and Examples:** The company has indicated that using the Autonomy platform resulted in:
 - **Several million in cost savings per year** across various operating areas.
 - **Cost reductions of 20%–30%** and **analysis lead-time reduction of 30%–75%** on their digitalization platform.
 - **Specific Applications:**
 - Managing complex processes related to the introduction of new parts due to design changes for a variety of aircraft models.
 - Supporting margin reviews and cost reduction for certain aircraft options.
 - Mastering electrical harness configuration changes and reallocation by providing multivariate analysis to prevent waste in manufacturing.



Conclusion—The future of aerospace is autonomy

As manufacturers scale production, MROs manage supply and workforce shortages, and airlines/operators manage aging fleets, autonomy is becoming essential. Avathon's Autonomy platform embeds decision-making directly into operations, accelerating throughput, improving quality, repairing networks, and strengthening fleet readiness.

With Autonomy for Aerospace Operations, Avathon is empowering the aerospace industry to optimize all phases of the aviation lifecycle—from build to maintain to sustain—preserving efficiency and resilience, ensuring fleet readiness in an environment of constant political/regulatory change and economic constraint. Avathon's Autonomy platform unifies data from the factory floor to the hangar to the flight line, turning disconnected systems into coordinated, responsive, AI-driven actions. By linking asset health, supply chain signals, and workforce capacity and skills with the power of AI, aerospace organizations can detect issues earlier, prescribe precise solutions, and sustain readiness at scale. The next era of aerospace operations will belong to those who adapt intelligently—with autonomy.

About Avathon

Avathon delivers industrial autonomy powered by AI and knowledge graphs, enabling organizations to connect data, decisions, and execution across operations. Its Autonomy Platform brings decision intelligence and execution to the world's most critical industries, empowering safer, more resilient, and more efficient operations.