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How to capitalize on AI in aviation maintenance

Airlines keen to implement AI for maintenance tasks need a comprehensive implementation plan to avoid making expensive errors, says **Cameron Byrd**, CEO and Founder of AIXI



“...leaping into AI without a well-thought-out plan could end up costing teams a lot of money and degrade faith in AI tools...

This article covers the high-level steps to take when deploying AI and machine learning (ML) in aviation maintenance. It highlights the issues around deployment and shows where companies can save money quickly. It explains how airlines can use AI to move from reactive maintenance to predictive operations.

KNOW WHAT YOU WANT

A common challenge facing CEO and leadership teams, not only in airlines, but in business generally, is understanding exactly what they want from AI. There is an urgency to adopt AI, but companies don't exactly know how to do it (figure 1).

Artificial Intelligence: A Practical Necessity



FIGURE 1

However, leaping into AI without a well-thought-out plan could end up costing teams a lot of money and degrade faith in AI tools, resulting in an entire AI program having to be shut down until you try again. The same problems with implementing AI can happen repeatedly, so it's important to get it right the first time. The core problem that most businesses have with AI is that they don't understand that it is more difficult to roll out than regular software.



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“ You need a data engineer or someone with experience in data-cleaning and data integration to get all the data in the right form.

An expensive problem

AI adoption is such a big challenge that 95% of AI pilot programs fail to reach production, see figure 2. In fact, AI research and deployment company OpenAI is so familiar with this problem that it started a consulting business to help companies put AI into their systems. In March 2026, the minimum buy-in just to start this with OpenAI is \$10 million, so they would be taking your money right to the bank.

START WITH A STRONG USE CASE

Picking a suitable use case is important when deciding how to introduce AI. To do this, you need someone who understands the domain that you're working in. They should have a strong understanding of aviation, as well as a solid foundation in data science. With this background, your AI lead can help you pick the right use case and keep it simple (figure 2).

The Problem: The Anna Karenina Principle*

“For a complex endeavor to succeed, all necessary factors must be present, while a failure can occur due to the absence of just one of them.”

Success
Requires
Alignment

- Experienced data scientists
- Strong business operations knowledge
- Access to necessary data
- Proper infrastructure (compute, iPad access, redundancy, security, etc.)
- Outreach/teaching
- Business support
- IT support
- Model creation
- Change management (people/culture impact)
- AI/ML Ops (monitor and update)
- ROI monitoring

*Tolstoy's Anna Karenina

FIGURE 2

People often think AI is going to be a robot that changes their world. However, AI is best when used for simple things, like finding all the times you 'fat-fingered' a key and made an error entering part numbers. We have found airlines that have tried to do an AI project internally come back to us one, two, even three years later. They've just been burning money. The

fastest and easiest way to successfully implement an AI solution is to find a partner that's already completed a successful install somewhere else. They can lead you through the process in a timely manner and within a more reasonable, predictable budget.

FINDING THE SIGNAL IN THE NOISE

Once you have established an AI use case, you need data from your organization to identify the 'signal' about when an event is going to happen, such as a predictive maintenance event (figure 3). If there is no signal, then your AI isn't going to work. However, finding that signal can be difficult for aviation companies with data spread across multiple systems. You need a data engineer or someone with experience in data-cleaning and data integration to get all the data in the right form. Identifying the signal won't necessarily be right there on the surface.

Data: No Signal, No AI

Common Aviation Challenges:

- Data spread across multiple systems
- Poor labeling or inconsistent records
- Limited historical availability
- Manual logbook inputs
- Data governance constraints

AI systems depend entirely on data quality and accessibility.

Necessary skills include:

1. Data engineering
2. Data cleaning
3. Data integration

FIGURE 3

BUILD THE INFRASTRUCTURE

Next, you need the right IT infrastructure to support your AI. The infrastructure to run an AI program needs to operate quickly and effectively, so you can get the right information to the right people in a timely manner (figure 4).

Infrastructure: Who, What, Where and When

Key Considerations:

- Compute resources
- Data pipelines
- Security and compliance
- Redundancy and reliability
- Integration with operational tools
- Edge access (tablets, maintenance systems)

Infrastructure gets **the right information to the right people at the right time...** even if they are upside down stuffed in a tight space.

FIGURE 4

“ You’ve got to convince people in your organization that they want to use AI.

Consider the end consumer of your AI tools. The person needing the AI-generated data might be a mechanic who’s physically upside down while working on a plane and wants information right there. He doesn’t want to extract himself to get it. He wants to pull up his iPad and access the information as easily as possible.

GAINING INTERNAL SUPPORT

Perhaps the most difficult part of getting an AI project off the ground is gaining internal support (figure 5).

Internal Support: **Danger Politics Ahead**

Successful Deployment Requires:

- Organizational alignment and support
- Education
- Collaboration
- Clear ownership

AI adoption is rarely based on the merits of a solution, but rather the **political maneuverings and motivations of stakeholders.**

FIGURE 5

You’ve got to convince people in your organization that they want to use AI. There are examples where an AI solution with the best merits and the highest accuracy didn’t make it into production. This can happen when tools created by the ‘nerdy tech guys’ don’t have a champion who can lead the political manoeuvring necessary to gain senior-level support. You have to be careful about AI solutions being taken on for personal or internal political reasons, rather than a sound business case.

OVERCOMING THE CHALLENGES

There are plenty of other pitfalls along the way to the successful adoption of AI. If you determine the use case and put in place the right infrastructure, future problems can still crop up, and these issues are rarely related to the AI model or method. (figure 6).

It is important to implement plans to monitor and maintain your AI model. An AI model that only solves a specific problem, but lacks a broader operational value, can prove to be a costly investment in the long term.



Model Creation: **The Easy Part**

Common Challenges:

- False sense of security from early model successes
- The brilliant engineer who wants to build a model but then gets bored and moves on
- A model without a use case
- No plan to monitor and maintain the model
- A model that solves a problem, but has no broader operational or business value
- Years of wasted time and money

Best advice →
Get out of your own way.

The model itself is rarely the bottleneck.

FIGURE 6

Topping the list of challenges is usually a false sense of security gained from early progress made during an AI implementation. This can create an unrealistic ease and confidence. Also, early success by an IT engineer or an AI project manager could encourage them to move on to other things, so you might lose their expertise.

BRINGING USERS ON BOARD

When AI products are rolled out without a clear plan, it is unlikely to gain widespread adoption (see figure 7). In some cases, airlines have turned on a new AI product, only to find that no one uses it. It sat there, mothballed. You need to roll out AI in an orchestrated, planned manner so that practical application, excitement, and adoption can follow.

Roll Out: Getting People to Use It

Key Considerations:

- Workflow integration
- Training and education
- Clear value to users
- Trust in system outputs
- Feedback loops from operators

Operational adoption determines success.

The project will fail if you just turn it on and expect adoption.

Solutions must become part of daily operations.

FIGURE 7

One way to do that is to limit use to a few people who are really interested in AI. Let them test, use, and play with it. They will give you critical feedback, then share their experience with their colleagues. Adoption will grow in a structured and organic way, gradually gaining more widespread adoption as part of an airline's daily operations. Other ways to support AI adoption include training and education that clearly lay out its value to users, so trust is built in the new technology. Obtaining user feedback is an essential way of ensuring an AI model is working as intended.

MONITORING PROGRESS

If your AI is given bad information, then you're going to get bad results, see figure 8.

Monitoring & Updating: A Full-Time Job

Key Tasks:

- Model performance tracking
- Data drift detection
- Retraining models
- System reliability monitoring
- Operational feedback integration

AI systems require continuous monitoring.

A successful AI deployment requires and plans for ML Operations (MLOps).

FIGURE 8

“In some cases, airlines have turned on a new AI product, only to find that no one uses it. It sat there, mothballed. You need to roll out AI in an orchestrated, planned manner so that practical application, excitement, and adoption can follow.”

Monitoring and updating an AI model can be a full-time job. You have to constantly evolve the AI to maintain its accuracy. This includes meeting the changing needs of the airline, advances in aircraft configurations, and changes in computer languages.

RETURN ON INVESTMENT

In the commercial world, an AI solution has to add value and deliver an adequate return on investment (ROI), see figure 9.

Return on Investment: What Business Want

Key Challenges:

- There is no value
- Remembering to quantify value
- Knowing how to measure value
- Validating value
- Convincing business units of value

Any AI implementation must deliver a clear dollar value.

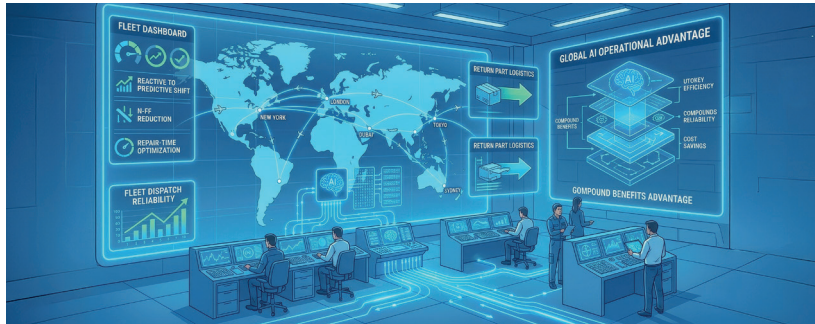
If the solution is fundamentally changing the course of human evolution while achieving world peace and doing your taxes, it can still fail if you can't assign a value to it.

FIGURE 9

You need to know how to quantify and measure the value of AI, otherwise you might not convince decision-makers in your organization to deploy the AI solution.

ROI examples

There are cases where companies installed AI without meaningful calculations for ROI, and the AI program was eventually shut down. Despite the AI model saving the business money, the technology investment was wasted because no one had quantified the cost-saving benefits (see figure 10).



KEY TAKEAWAYS

Aviation is an industry defined by margins, reliability, and operational efficiency. Small improvements in areas like dispatch reliability, maintenance turnaround times, and component replacement timing can translate into massive economic benefits. AI can be an enabler for airlines to gain compounding operational advantages (figure 11).

Key Takeaways

AI implementation requires full-system alignment.

Successful AI deployment requires:

- The right use case • High-quality data
 - Production infrastructure • Organizational alignment
 - Operational integration • Continuous monitoring
- And... you don't have to do it alone.

Calculating ROI: Conservative Method Examples

Benefit Area	AIXI Product	Potential ROI
\$150k per FTE replaced • 5 FTEs	ATA AutoCoder	\$750,000 / year
\$1.20 per minute research time savings • 1,200 unplanned line mx / * 5 min time saved / query • 40 complex queries / day * 240 min (4 hours) time saved / query	Ask OTTO	\$2,628,000 / year \$4,240,800 / year
\$1,050 per hour for an AOG lease cost • 8 hours / day	Prescriptive Maintenance	\$3,066,000 / year
\$15,000 per hour AOG lost revenue	Repeat Defect	\$43,800,000 / year
\$25,000 per day extra aircraft • 1 aircraft saved	Full Flight Deck Suite	\$9,125,000 / year
\$1,000 / NFF part return • 5 / day	Prescriptive Maintenance	\$1,825,000 / year
\$250 / delay min • 0.67% reduction in delays • 2.3M delay mins / year	Prescriptive Maintenance	\$3,900,000 / year
		\$69,334,800 / year

FIGURE 10

Replacing employees with AI is one way to gain an ROI, although not all companies are keen to lose people. Instead, they might look at moving people to other roles that bring strategic value. It's worth remembering that if you free a person from redundant, boring, and mundane tasks and shift them into more meaningful, exciting, and interesting work, then they are significantly more likely to be more productive.

AI can speed up research tasks, which can quickly add up to significant time and cost savings. For example, a mechanic can use AI tools to reduce the repair time on a job. Another area that brings immediate ROI is on return parts with "no fault found" because you didn't have critical information at the outset about how to repair the aircraft. The cost of parts returns really adds up. So, too, does the cost of delays that might have been avoided if AI had been deployed to find a solution.

FIGURE 11

It goes without saying that installing AI is complex. The technology has to work, and the business has to champion the effort. Use cases and ROI must be prepared. It only takes one small thing going wrong for an entire AI project to fail.

CAMERON BYRD



Cameron Byrd is the CEO and founder of AIXI, where he blends his expertise in artificial intelligence, computer science, engineering, and math with his passion for aviation. A private pilot, Cameron's AI career began after a chance encounter at his local airport over 16 years ago. In 2019, he founded AIXI to help airlines like Southwest leverage decades of historical maintenance and reliability data for real-time decision support that enhances safety and asset uptime.

AIXI



AIXI creates AI-enabled solutions that improve reliability and asset uptime for the aviation industry. Their industry-specific language model (ILM) and AI tools scan, recognize, assimilate, and aggregate an airline's foundational MRO data to improve safety and reduce delays. By first standardizing ATA code data, AIXI ensures MRO data accuracy, a critical first step for most reliability tools including true prescriptive and predictive maintenance. This adds structure to complex maintenance logs both new and historic. By leveraging this base-level data, AIXI creates a framework that increases asset uptime and reliability.

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