



# AI-Powered Maintenance for Battlefield Readiness and Logistics.

Shortening scheduled maintenance times is a top goal for most maintenance teams. But shortening unscheduled maintenance times? That sounds like the start of a bad joke.

Improving operational availability on the battlefield involves the unfunny headache of pulling data from multiple maintenance systems, such as inventory, resource allocation, historical maintenance data, asset usage data, personnel scheduling and so much more. Then, teams have to analyze all that information in the hopes of surfacing the insights needed to make the right maintenance and supply decisions.

However, innovations in AI and advanced analytics technology help empower maintainers to not only optimize operations and logistics management but also accurately plan ahead for future repairs.

## AI and the Long Tail of Logistics

Earlier this year, Forbes reported that dozens of much needed Leopard 2 tanks in Ukraine have been out of service due to a lack of spare parts—leading repair workers to have to use stripped parts from other wrecked tanks and first repair the damage to these parts before work can begin on the remaining fleet.

Delayed maintenance has also affected the U.S. Navy's submarine fleet, with 37% of the Navy's nuclear-powered attack submarines unavailable for service as of 2024. Likewise, maintenance challenges have grounded many of the military's F-35s. According to a March 2023 report from the Government Accountability Office, only 55% of planes were considered mission capable.

Developing a more efficient and reliable sustainment strategy is crucial to keeping military fleets and equipment mission-capable at all times. This long tail of logistics can be achieved by leveraging AI-powered analytic applications.

Rather than approaching data gathering and analysis manually, the use of AI automates data integration and insights across the technology stack. The analytics platform helps maintainers analyze asset risks, operational plans, resource constraints, and optimize maintenance and repair schedules, enabling teams to mitigate risks and identify areas for improvements more quickly.

For example, AI can tailor spare parts packages based on historical maintenance data for specific units and missions, ensuring that the right parts are available when needed, thus reducing downtime, especially to remote or forward-deployed units.

Furthermore, by continuously analyzing data from various sensors on military equipment, AI algorithms can even tell when a component is likely to fail, allowing for timely maintenance before a breakdown occurs. This proactive maintenance strategy enhances operational availability and even extends the life of parts and equipment, ensuring readiness and minimizing unscheduled maintenance.

## How Explainability Shortens the Path to Understanding

In military sectors, the path to adopting innovative technologies isn't a fast or easy one, but working together to democratize data is essential to improving sustainment operations. With AI, the path is less murky as long as it's explainable.

Explainable AI (XAI) is a key component in both decision intelligence best practices and ethical AI principles. XAI removes the "black box" nature of AI and delivers on the human (and government) need for clear, understandable, and trustworthy outcomes.

**To create this trust, XAI strikes the right balance between interpretability and accuracy by:**

- ▶ **Identifying insights and recommendations hidden in the data.**
- ▶ **Explaining in natural language to the user why these insights and recommendations are significant and justifiable.**
- ▶ **Augmenting explanations with visualizations to help users better understand how the system came to its conclusion.**

To achieve all of the above, XAI takes on a conversational tone that feels more like an advisor is instructing you rather than a machine. By explaining the next steps in the form of a narrative, non-technical users don't require a data expert to interpret them, which helps all maintainers more quickly grasp the significance of any data-driven recommendations and act on them in a timely manner.

Beginning with a pilot project for AI-powered analytics is an effective way to prove the value of XAI technologies in specific areas, such as logistics optimization. Maintenance leaders can use the results of these projects to advocate for more budget and resources to contract and implement AI throughout their operations. Additionally, a phased implementation strategy can help ensure a smooth transition to AI-powered systems.

AI technologies offer immense potential to enhance operational availability, reduce maintenance times, and optimize logistics. As AI continues to evolve, its integration into military operations will undoubtedly play a critical role in future mission success.

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