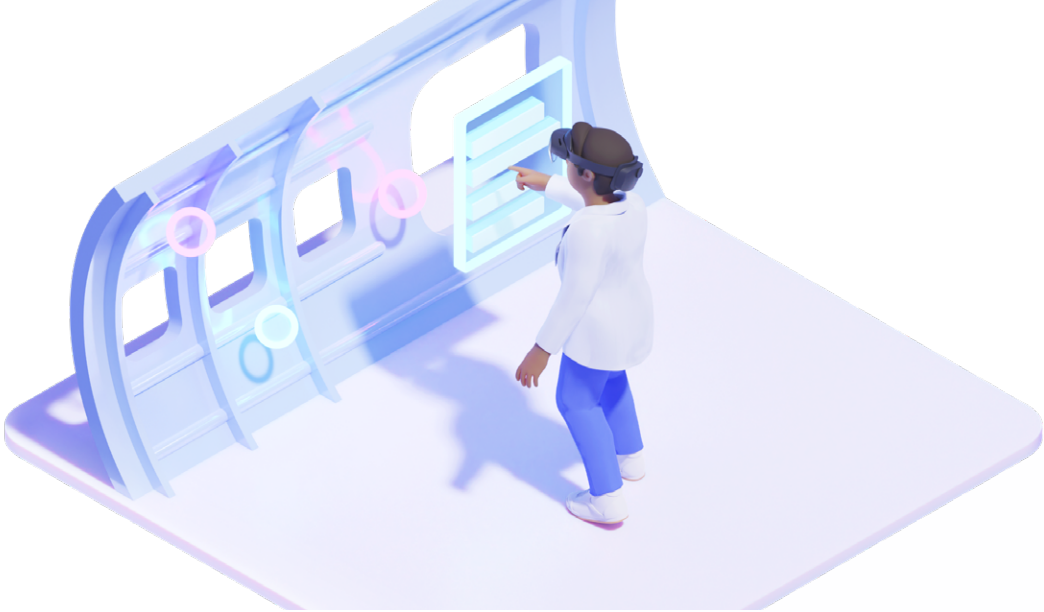
OVA

STELLARX



Use Case: Predictive Maintenance

Aircraft inspection is a critical part of commercial aviation operations, and has to be performed continuously. The use of composite as a material of choice for aircraft fuselage has increased significantly over the past decades, as well as the volume of aircraft produced. Consequently, to meet increasing demands, the composite manufacturing process was automated. With more parts produced at a faster pace, the need for efficient quality inspection and repair became critical.

BOMBARDIER

Client
Bombardier

Industry
Aerospace

Technologies
Augmented Reality, Object Recognition, Digital Twin

Challenge
Prediction

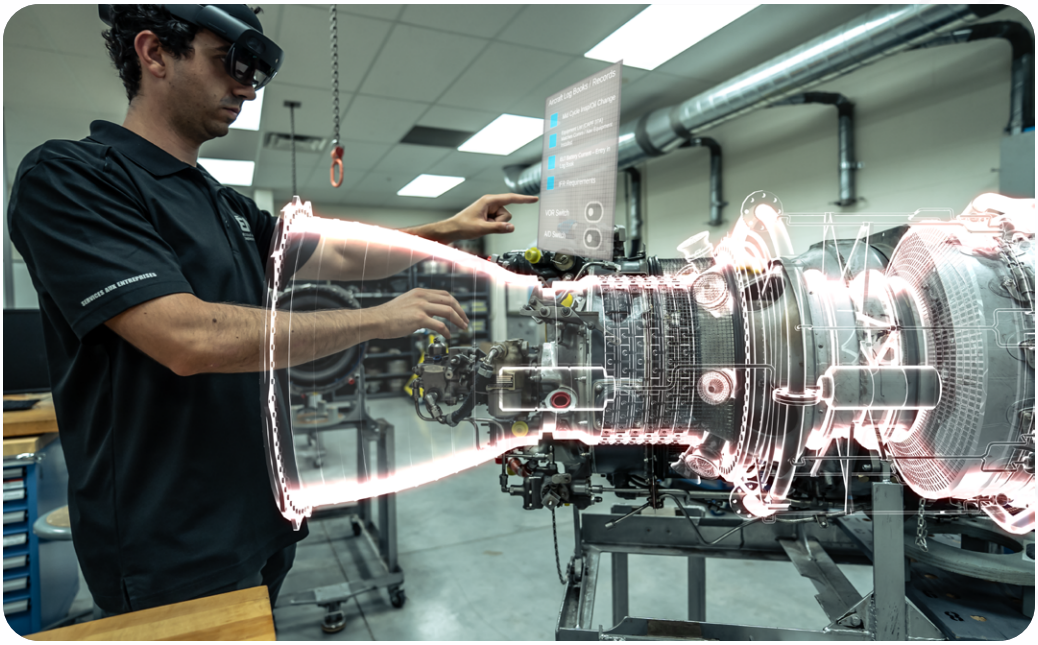
Solution
Augmented Reality for quality control

Benefits

- Increased productivity
- Saved time
- Better quality

One of the crucial steps when manufacturing fuselage panels is visual inspection: each defect must be individually located, and then verified by an operator before transitioning into the next stage. Yet, due to the very large dimensions of fuselage panels as well as their material characteristics (dark, very little reflection, and few features to be used as anchor points), this task can be quite cumbersome. When defects are first identified by the machines placing the composite fibers, raw report logs are produced; the necessary repairs must then be manually mapped by technicians, who often rely on written records and photographs to guide them. Information must be double or triple-checked to ensure complete accuracy, which inevitably leads to elevated production time.

To solve this issue, among other approaches, Bombardier initiated a project with OVA to help its operators locate defects on A220 composite parts by using Augmented Reality. The goal was for the composite manufacturing robot to provide the precise location (on a X,Y & Z axis) of every possible defect to the Augmented Reality device which, in turn, would display the defects on a digital twin of the fuselage part and guide the operator.

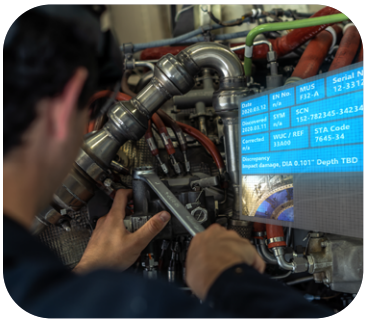


The real time-saver

We used StellarX, our XR sandbox platform, to achieve this goal. Our AR solution allowed the operators to quickly identify key coordinates, verify and update their status through an easy-to-use interface, examine historical and current data in real-time, and execute comparative analyses of the fuselage pieces before, and after the inspection. It also allowed for the automated creation of a detailed Quality Control report.

The delivered system consists of spheres locating the potential defects identified by the composite layering robot. Through a movable floating interface, the technician can then quickly inspect the location, and update its repair status in real-time.

Machine learning algorithms developed for this project increase Hololens object detection significantly, allowing for better anchoring, more precision, and thus, more efficiency.



Our technological solution was developed and tested as a prototype in a production environment over the course of 6 months. StellarX AR proved to be robust enough for industrial usage where, for example, the operators had to perform heavy repairs on aircraft components.

This Augmented Reality technology, as well as its fully customizable floating interface, definitely enables brand new capabilities for manufacturing and quality control.

We believe StellarX toolkits such as this one could have a dramatic impact on spatial planning, asset tracking, asset state determination, data collection, aggregation, physics-based simulations, digital architecture, and process automation, thereby benefiting various customer bases and industries.

Over the course of this project, a new paradigm has emerged in the field of advanced aerospace manufacturing. Some more hands-on research has already taken place simultaneously, enabling a cycle of innovation and continuous improvement through predictive maintenance, real-time monitoring and quality control. Learnings from this first phase have led us to a plethora of possibilities to push the development of inspection tools using Augmented Reality, not only for the Transportation industry, but for many more. In fact, the second phase is currently in progress, and has been funded through Scale AI.

Results

A year after the implantation of the technology, Bombardier has noted a 260% increase in productivity, and 5 hours of saved time per plane produced. Equipment reliability and robustness has increased, while the workload of the operators as well as the administrative burden has drastically decreased. The overall results were very encouraging, and new potential applications have been identified.

This project has demonstrated the mutual benefits of data-driven collaboration, enabling advanced computational and modelling approaches and commercial technology development opportunities. We have now informed, developed and evolved Technology Readiness Levels and Commercial Readiness Levels related to the project's key industrial digital technologies.

Testimonials

“ This is how today’s Bombardier is operating. This is a prime example of how innovation will help our operator meet their true potential. ”

- ***Buu Khanh Vo,*** R&D Specialist

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