Increased Intelligence

Smart aircraft drives MRO industry

By Aprajita Anil

WITH A FLEET OF MODERNISED 'SMART aircraft' taking to the skies, the changes are very apparent in the entire ecosystem of the Maintenance Repair and Overhaul industry (MRO). Equipped with innovative technologies that can record and deliver important clusters of information, these aircraft are bringing in important changes in the approach of their maintenance and repair.

VR and AR

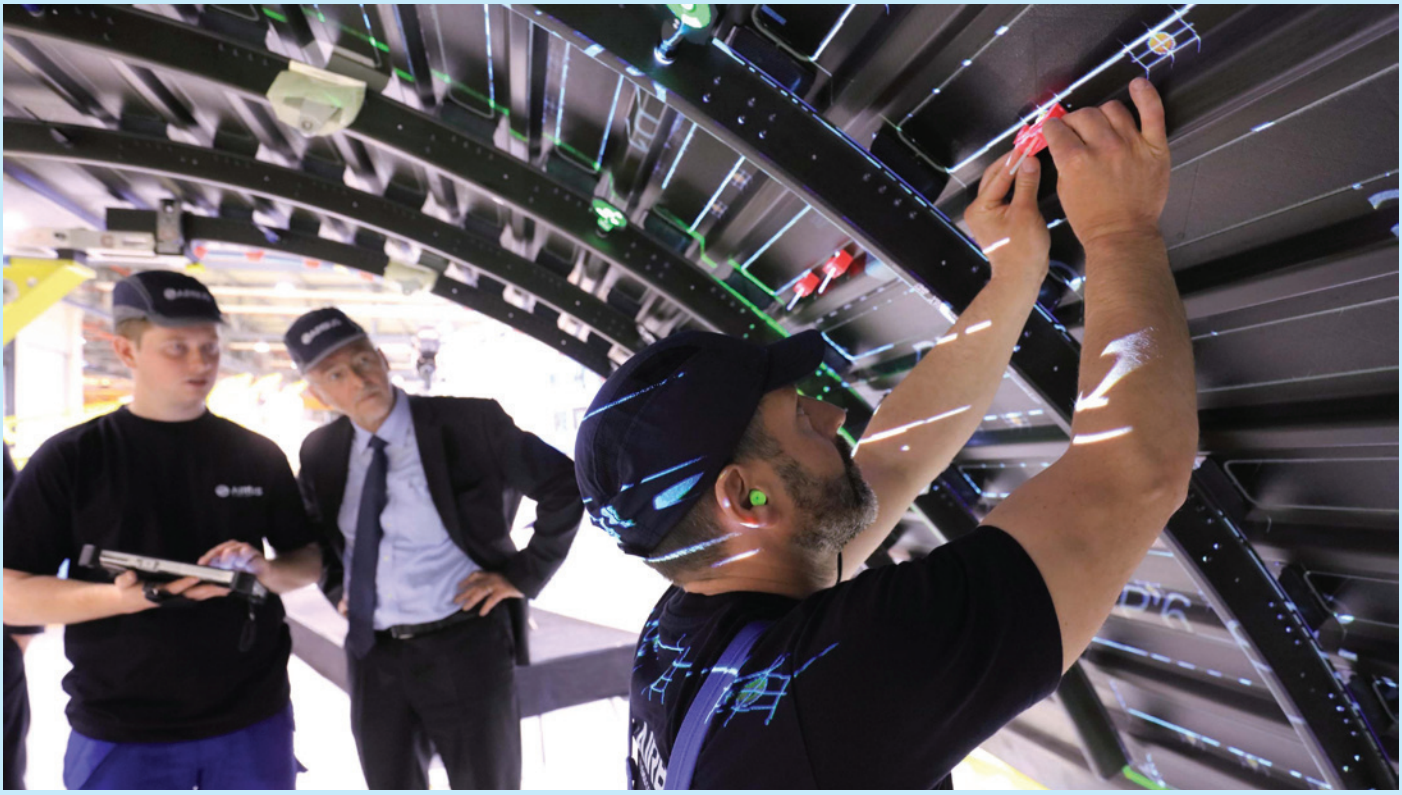
With maintenance accounting for over 10 percent of costs associated with any flight, maintenance technicians are critical to unlocking healthy bottom-line benefits. Virtual and Augmented Reality (VR and AR) can help them get their work done faster, with a higher degree of safety. Speaking to the Asian Airlines and Aviation, Mr. Ramesh SivaSubramanian, Head Innovation Lab, Ramco Systems said, "With significant adoption of mobile devices, the MRO industry is now embracing disruptive technology like Robotics / Artificial Intelligence and are further evolving in order to diagnose defects through wearable devices."

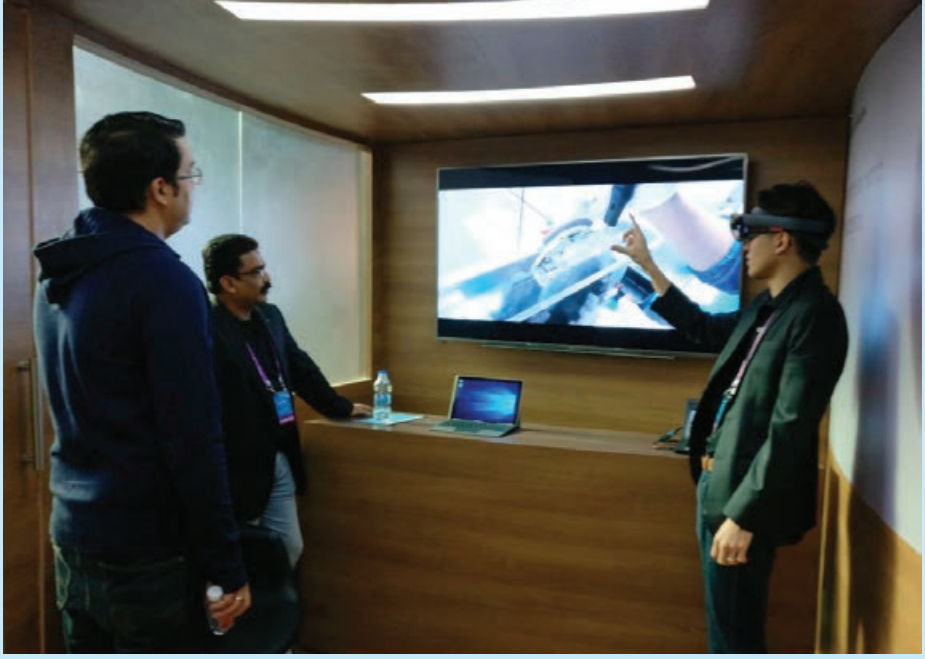
Supported by the Singapore Economic Development Board (EDB), Ramco Systems with AFI KLM E&M as the first anchor partner, have opened an MRO Lab to develop advanced aviation IT solutions such as wearables for ground engineers and drones to inspect aircraft on the tarmac. "From facial recognition, gesture computing, augmented reality to robotics and blockchain, the lab has been developing effective solutions and use cases for the Aviation and Logistics industries," added Mr. SivaSubramanian.

The physical environment and complex nature of the work provides a compelling use case for AR to transform their workflow. Leveraging on this technology, Airbus has collaborated with Accenture to develop smart glasses to enable millimeter-precise positioning during the cabin installation marking process. Before the arrival of smart glasses for in-cabin applications, the technical team had to decipher complex drawings and convert imperial measurements into metric measurements in marking the position of the equipment on the cabin floor. The operation that used to require three people and three days, now only needs a single person operator and six hours. The company will also deploy the smart glasses this November aboard the No. 3 A330neo aircraft.

Emerging Technologies

Airbus' Stade factory has also introduced an innovative 'mixed-augmented reality application' called "MiRA". It is a tool aiding in the production of A350 XWB fuselage shells. Whereas production staff previously used to manually progress through the installation steps, now, a projector casts a 3D image on the fuselage which is based on data from the





digital mock-up (DMU) and shows them the exact position for the bracket. The overall processing time for bracket installation has been reduced by 30 per cent while achieving 'right-first-time' quality.

AR is just one of a number of emerging technologies that is transforming the way airlines perform maintenance, repair and overhaul. Recently at the Farnborough Airshow, Airbus utilized an Unmanned Aerial Vehicle (UAV) to perform a visual inspection of an A350 XWB. The UAV or drone, was equipped with a high-definition camera and took a series of pictures of the upper part of the aircraft while following a predetermined flight path. A human operator piloted the UAV.

Using this technology, the images obtained, especially those showing scratches, dents and painting defects, are then compiled in a 3D digital model, recorded in a database and analysed. This data then helps improve traceability, prevention and reduction of damage. This innovative tool helps reducing the aircraft downtime for inspection significantly. While the conventional method for data acquisition took two hours, the use of drone reduced the time frame to 10 to 15 minutes,

"The use of this new technology offers better working conditions including improving the safety and comfort for the quality inspectors", said Nathalie Ducombeau, Airbus head of quality. Operators no longer need to go up on a telescopic handler to perform the visual inspection, sometimes in poor weather conditions. In addition, picture analysis can be done anytime afterwards and in an office. Aircraft visual inspections are an important part of the production process. It is part of the Airbus quality standards.

EasyJet too began limited use of this technology as a new way of inspecting process of its Airbus A320s, and it's taken to using these unmanned aircraft to check for lightning damage to incoming planes. In order to get a detailed visibility on cracks and be able to plan better for replacing the runways, Atlanta airport is using drones to help with runway maintenance. A process that has been taking up to five hours and a deployment of an entire team to assess the runway wear and tear, is now getting done in half the time. Thus, allowing the runways to be open for a longer time.

Data Driven

With digital technology accelerating at an incredible speed, a vast amount of data is collected through IoT sensors in modern aircraft fleet. MROs are therefore in a position to use these analytics to produce outcome-focused recommendations for operations and maintenance. This is prescriptive maintenance. It adds the ability to give advice to the technician on what to do and how to do the repair by taking advantage of artificial intelligence (AI) and machine learning. Although in its early stages, it has the potential to become maintenance best practices.

Bombardier C-Series jetliner is also fitted with 5,000 sensors that generate up to 10 GB of data per second. A single twin-engine aircraft with an average 12-hour flight-time can produce up to 844 TB of data. During the 1980s, the number of detectable faults on a Boeing 767 was 9,000. Now, intelligent sensors on a Boeing 787 can detect 45,000 faults, five times as many as the rate 30 years ago. Aircraft Health Monitoring System, driven by IoT, has the added benefit of being able to analyse data from one aircraft to detect the same potential fault on an entire fleet, helping to drastically reduce the chance of AOG for airlines, which can cost an airline up to US$150,000 an hour.

Additive Manufacturing

One of the most important result of the ongoing digital transformation is 3D printing (additive manufacturing). Continued integration of this technology could turn the shipment of aircraft parts into an electronic exchange of 3D printing blueprints. Although the technology is still in its initial phases, adoption on a major scale has incredible implications for the industry.

Airbus has just completed for the first time the installation of a titanium 3D-printed bracket on an in-series production A350 XWB. The bracket is part of the aircraft pylon, the junction section between wings and engines. 3D-printed parts are already flying on some of Airbus A320neo and A350 XWB test aircraft. These include metal printed cabin brackets and bleed pipes.

The changes being brought in through digital transformation in areas like machine learning, autonomous production, and the industrial internet of things (IIoT), promise to be even more disruptive and drive further change than what the manufacturing industry has experienced in the last two decades. Maintenance delays and unexpected downtime are a heavy financial burden to the airline industry. Therefore, embracing the next-generation technology is the only alternative the industry has, in order to safeguard a business from the effects of delaying digital transformation. ■

OPPOSITE PAGE: AR is already transforming the way airplanes are manufactured and overhauled. The picture shows Airbus' MiRA tool aiding in the production of A350 XWB fuselage shells

TOP: The rapid growth of digital technology and vast amount of data collected by onboard sensors in aircraft and systems will dramatically transform how MROs do business