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FROM TURBULENCE TO TRIUMPH

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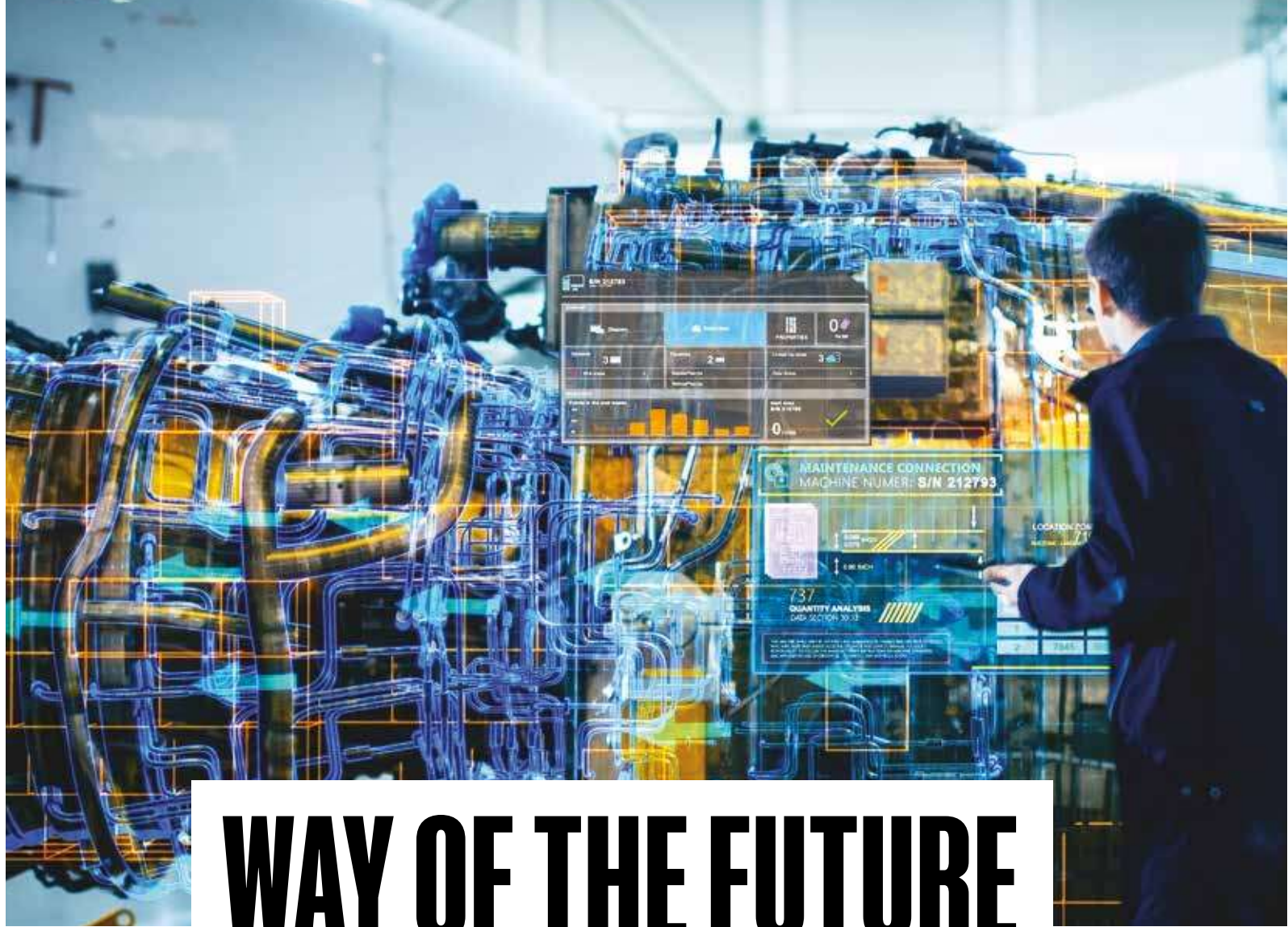Technology is changing the way airlines and pax intersect

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SUPPLY SYSTEMS
Efficiency is key in the latest machine-learning systems

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An eVTOL that could become a production reality

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WAY OF THE FUTURE

Aviation supply chains face a range of challenges. Could AI and other forms of smart technology help smooth the process? **Gerrard Cowan** investigates

Supply chain pressure, razor-thin margins and a lack of trained personnel are a headache for the MRO business now. Fortunately, Adnan Mansur, head of digital and innovation services at Asia Digital Engineering (ADE), believes that up-to-date computer systems can provide an effective pill to relieve many of these problems.

"As aircraft come preinstalled with smart sensors, monitoring the real-time performance could enable us to predict maintenance and component needs, hence improving predictability and reducing unplanned downtime," he explains.

Additionally, Mansur points to challenges around limited resources, complex logistics, ageing aircraft and regulatory compliance. Digitalisation and smart technology can help address these challenges, he notes.

For example, he outlines the scope for resource optimisation – in other words, better planning.

This includes predictive maintenance. His company has developed the 'Elevade' fleet and resource management application, which utilises real-time aircraft data to monitor and manage aircraft defects. This enables real-time visibility of aircraft defects and trends, as well as streamlining real-time, inter-department communication to remove potential silos, "which could result in duplicate orders and tasks".

Data forecasting

Mansur also details the benefits of data-driven demand forecasting, with AI and machine learning (ML) tools analysing historical consumption data to predict parts demand, cutting excess inventory while avoiding shortages.

"Advanced analytics help simulate various 'what-if' supply chain disruption scenarios allowing users to be one step ahead preparing a strategy mitigation plan," he says.
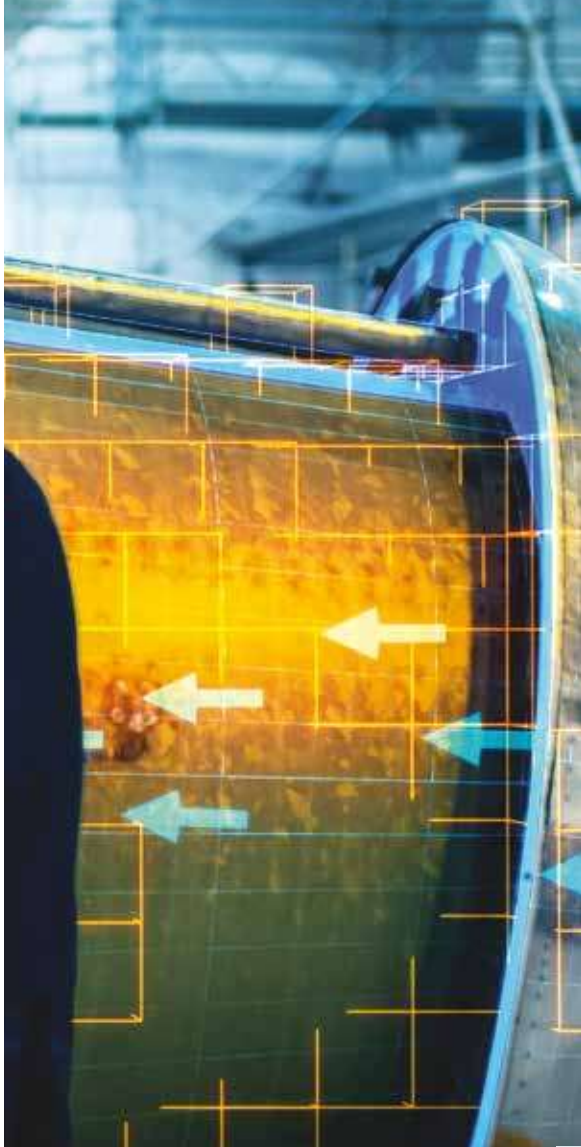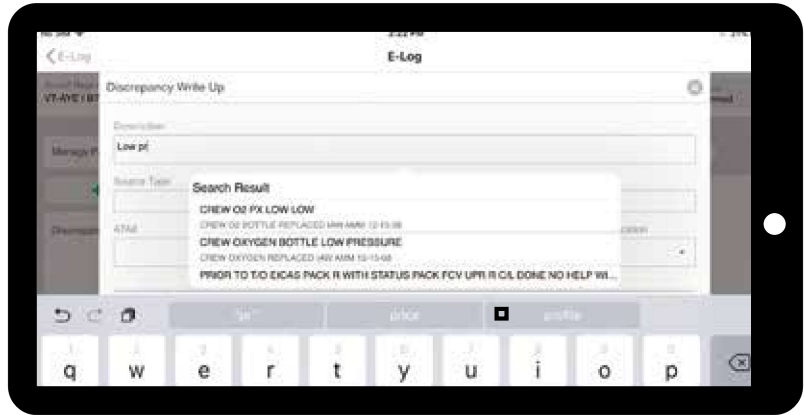
"AI OPTIMISES RESOURCE ALLOCATION, MINIMISING UNNECESSARY WASTAGE IN OPERATIONS AND MAINTENANCE"

Additionally, the technology has potential uses in waste reduction. As Mansur explains, "AI optimises resource allocation, minimising unnecessary material wastage in operations and maintenance."

Compatibility

Sander de Bree from Schiphol-based EXSYN Aviation Solutions stresses the need for compatibility with existing aircraft systems. "These industry software systems (such as AMOS, TRAX and RAMCO) are aircraft type independent," he says, adding that his firm's platform has been designed to integrate with maintenance information tracking systems.

"This is a real-time connection over IPSEC VPN. In addition, when it comes to aircraft onboard data we typically make use of the data stored on the flight data recorder. This is not via Wi-Fi/5G connections but uses offline downloads of the flight data recorder via QAR disk readouts that need to happen every 14 days or 7 days, dependant on the type."

De Bree notes that the platform offers apps for maintenance & engineering analytics and automation. Using these apps, airlines can automate data heavy M&E back-office processes (such as

aircraft entry-into-service) and use that data for advanced maintenance analytics on aircraft reliability and maintenance processes.

Interfaces like the app make EXSYN easy to use. "The platform is built on the philosophy that users do not require advanced IT or data science skills to work with the applications," de Bree clarifies. "The key is to present actionable insights and recommendations without a primary need to deep dive into the way those insights and recommendations are arrived at. Users can still do that if and when needed, but it's not the primary purpose."

A spokesperson for MTU Maintenance says the digitalisation of certain MRO processes and the use of smart technology means the company "can make better decisions and offer more beneficial services, usually with the central aim of lower maintenance costs for the customer".

MTU also warns about the possible need for new infrastucture inside an organisation planning to implement major new systems, alongside cultural change. "However," the spokesperson says, "as long as you can show that they are to the benefit of the staff and the company – by ways of use cases, for example – then any potential resistance to change can be overcome quite effectively."

Saravanan Rajarajan, associate vice president – aviation solution consulting at Ramco Systems, says AI has gained significant traction, particularly in predictive maintenance. He also highlights the benefits of analysing historical and real-time data from the aircraft to predict component failure.

1. The digitalisation of certain processes and the use of smart technology is transforming the MRO industry
2. Ramco's 'Mechanic Anywhere' mobile app gives access to a wealth of documentation instantly

"AI can accurately enable parts forecasting to optimise inventory levels and line-replaceable unit (LRU) positioning at stations and even recommend alternative solutions," he explains.

Rajarajan says shop and hangar-level work has seen increased digital adoption. For example, Ramco's 'Mechanic Anywhere' mobile app "enables one to access technical documentation, book time, report findings, record measurements, and request parts and tools from the place of work. With the required regulatory approvals, task cards can be closed and signed off digitally".

Ramco's Aviation Suite leverages data and advanced insights to deliver insights using AI, according to Rajarajan. The Aviation Suite has brought a 30% reduction in turnaround time for Ramco customers, he notes, with benefits in line maintenance functions.

"For example, when a mechanic reports a defect, the system leverages the historical records pertaining to the type of aircraft and ATA code to suggest a list of similar defects that were resolved in the past," he says. "Based on the mechanic's decision, the system prompts the resolution options, reference manuals and parts and tools required to fix the defect," he notes, adding that the final determination on accepting the recommendations still lies with the mechanics involved.

Rajarajan believes AI could also empower the workforce through chat assistants, with Ramco working with customers on the technology. "They allow users to interact with the software through plain text inputs and generate insights for decision-making. For example, for an engine in the shop, a kitting supervisor can interact with the software to identify potential items that may cross the due date and request alternate recommendations."

It is important to adopt the technology in the correct way. AI-based technologies force MROs and operators to revisit data platforms and data quality, notes Rajarajan. Additionally, he says operators must train the AI systems in different data types, and relationships between structured and unstructured data sets.

ADE's Mansur points to a range of challenges in implementing such technologies, including high investment. "Implementing technology such as IoT sensors, AI systems and blockchain solutions requires significant upfront and maintenance costs," he explains. Sometimes the return on investment can be difficult to determine "as some benefits are intangible".

There can also be resistance to change, alongside challenges around data security and privacy and integration complexities. Organisations must also decide whether to procure off-the-shelf solutions or build their own. Mansur is aware that both options present their own advantages and challenges.

Still, he expects to see wider adoption of predictive maintenance, with AI further integrated into real-time monitoring systems, enabling more accurate material forecasting. AI could expand to include end-to-end automation, he says. "From procurement to repairs, AI could automate entire MRO processes, improving efficiency and cost control."

Finally, Mansur highlights the potential for blockchain in the coming years: "This could finally be brought up into mainstream and, coupled with AI (and/or GenAI), could create decentralised platforms for transparent and efficient MRO operations."

Rajarajan posits that the industry is still scratching the surface of AI, with potential deployment set to grow as more use cases are adopted and start delivering ROI.

"Due to the industry's highly regulated nature, improvements will be made in reducing false positives and proving that the results are accurate. Apart from ROI, the adoption will depend on approvals and cybersecurity risks," he concludes. ●

30%

Ramco's Aviation Suite has brought a 30% reduction in turnaround time for customers with benefits in line maintenance functions

1. AI systems can leverage data from mechanics to recommend the right parts and tools to fix problems
2. The EXSYN platform offers apps for maintenance and engineering analytics and automation

"FROM PROCUREMENT TO REPAIRS, AI COULD AUTOMATE ENTIRE MRO PROCESSES, IMPROVING EFFICIENCY"