aviationbusinessnews.com
OCTOBER 2024 • VOLUME 26 • ISSUE 7

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MRO Management

BIGGER & BETTER

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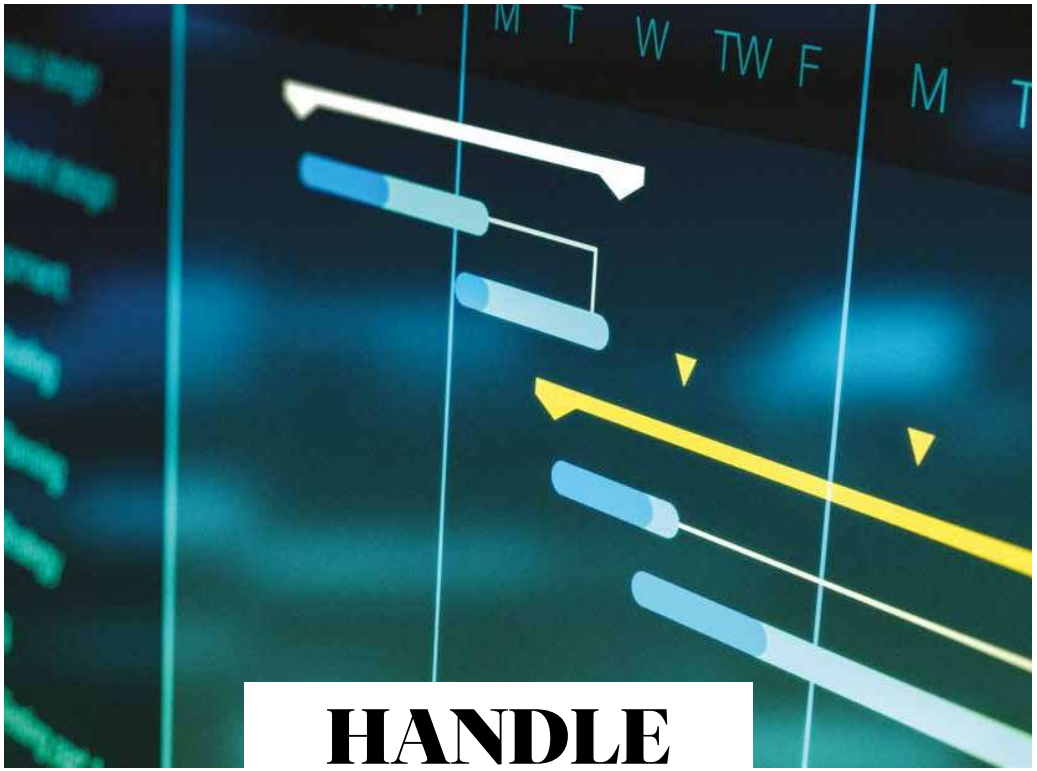

HANDLE WITH CARE

Machine learning (ML) and artificial intelligence (AI) are bringing opportunities – but users must tread with some caution when amassing data. **Kevin Rozario** reports

The need for improved efficiency, resource allocation, cost-effectiveness and regulatory compliance in MRO and CAMO (Continuing Airworthiness Management Organisation) has never been greater given the current constraints around supply chains and staffing bottlenecks.

In this environment, planning and scheduling software has become increasingly important in enabling MROs to shed light on system time-lags or glitches in order to maintain or ramp up productivity.

Suppliers in the sector are confident that integrated planning and scheduling software has become a 'must have', especially as machine learning (ML) and artificial intelligence (AI) bring a new level of insight to bear on the MRO business.

Cloud-based MRO software already provides enhanced scalability, accessibility and data sharing capabilities to enable better collaboration between MROs and airlines. Meanwhile real-time data analytics tools allow MROs to identify trends, optimise workflows and improve decision-making.

A spokesperson for Airbus comments: "One of the most important things is to digitise maintenance records and ensure seamless information sharing between CAMO and MRO. Both have to collaborate to unleash the value creation of an optimised maintenance programme. Predictability is the key – anticipation of the maintenance tasks to be accomplished (both routine and non-routine) is a must considering, of course, resources."

Dave Purfurst, global pre-sales director at aviation tech company Veryon, says: "The aviation industry is always striving for more efficiency, cost effectiveness and compliance in its MRO and CAMO operations. It is no longer about a single tool, but multiple, fully integrated solutions leveraging AI, ML and mobility. Bringing this multi-solution network into the cloud facilitates seamless integration and better collaboration between teams."

This theoretically ensures that data is always up to date and secure. Capturing data in real time while on the move has also become key to efficient scheduling. "Now, real-time capture facilitates AI/ML algorithms to analyse vast amounts of data from aircraft systems, as well as the MRO/CAMO solutions, to predict failures before they occur, thus reducing unplanned downtime and maintenance costs," says Purfurst.

Such multi-solution networks are replacing old ways of planning and scheduling maintenance with what Veryon describes as "condition-based predictive base maintenance". The company's solutions for MRO/CAMO can integrate with onboard systems and other solutions to simplify the planning and schedule of maintenance for its customers.

At QOCO Systems, founder and executive advisor Ilari Neitola highlights how staffing has become an issue. "The availability of qualified aviation maintenance professionals, such as aircraft maintenance technicians, remains a challenge, while the productivity of existing staff often suffers due to poor planning," he says. "This is particularly true in the dynamic environment of line maintenance, where rapid changes make planning and scheduling exceptionally difficult."

To address this, QOCO offers a package called MROTools.io Assignment, which applies modern optimisation models and AI to match personnel to the appropriate maintenance tasks. "This system dynamically allocates resources to work packages in real time, ensuring that technicians are assigned based on skill, availability, and work-order priority, thus boosting overall productivity and efficiency," explains Neitola.

On the value of AI, the QOCO Systems founder adds: "It is playing a critical role not only in improving the outcomes of planning but also in simplifying the user experience. For example, natural language queries allow users to ask direct questions and receive quick, actionable answers. Previously, such insights would have required time-consuming report development. This reduces complexity and accelerates decision-making, making planning more efficient and intuitive."

"LOOKING AHEAD, EVEN BY 12 MONTHS, SOFTWARE SUPPLIERS SEE FURTHER CHANGE, WITH AI PLAYING AN INCREASINGLY PIVOTAL ROLE"

DATA ACCURACY AND RELEVANCE

While the new tech sounds good, the crucial thing is that the data being picked up is precise, accurate and relevant. At India's Ramco Systems, Saravanan Rajarajan, director of aviation solution consulting, comments: "AI/ML-based maintenance planning is forcing MROs to revisit data platforms and data quality.

"The first step in AI-based maintenance planning is assessing the data capabilities and quality of the source systems. Existing infrastructure should have a clear process and workflow to collect the right data, and collected data should be governed by the right workflow controls.

"The second step is training the AI systems in different data types, the data context and the relationships between structured and unstructured data sets. For example, task data available in the AMM (aircraft maintenance manual) in digital formats, and available in PDFs from the customer, must be correlated meaningfully through training. Accuracy issues require constant intervention from the data engineers and business until the planning systems bring in real value."

This is doubly important at a time when MROs are seeing higher demand due to more aircraft coming back into service and older aircraft remaining in action longer due to new aircraft deliveries being held up. They are also seeing higher utilisation due

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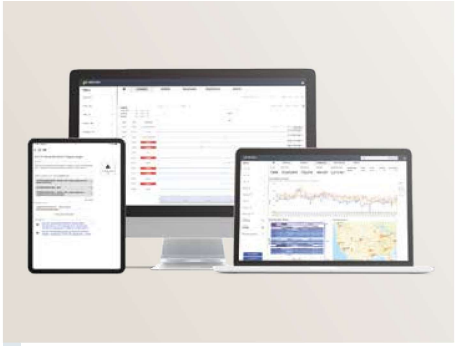

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to passenger and cargo demand which makes accurate planning and scheduling to determine any maintenance schedules all the more critical.

Rajarajan says: "They are also facing the severe challenges of an overloaded supply chain and acute labour shortages. It means the need to optimise resources has become critical to avoiding scaling back on growth." Ramco's maintenance planning modules integrate data on customer contracts, work scope, manpower availability, tools and parts availability, as well as historical data and leverage ML-based algorithms to produce tailored maintenance plans.

This type of smart deployment of planning and scheduling software is becoming more common in the current climate.

INCREMENTAL GAINS

QOCO Systems' Neitola says: "The key to managing supply chain disruptions and workforce shortages is to start by understanding your current processes and then implement improvements incrementally. If you're collecting data manually, the first step is to adopt a system that consolidates inputs from flight operations, maintenance schedules and staff availability into a single interface.

"This system should also visualise the information in a way that makes it easy to quickly identify potential bottlenecks in resource availability, helping planners react faster to disruptions. Once your data is centralised, the next step is to implement automation. With automation in place, planners can shift their focus to higher-value tasks and strategic decision-making, driving productivity gains even in constrained environments. It's important to have a clear vision and end goal in mind, even when starting small."

The rapid advancement in AI means that it is essential to focus on what an ideal solution would look like, regardless of whether existing software can meet that need. Neitola comments: "The fast pace of technology will likely bring that vision within reach sooner than expected. Moreover, setting KPIs and measurements from the outset is crucial. Start measuring key metrics right away to ensure you're heading in the right direction."

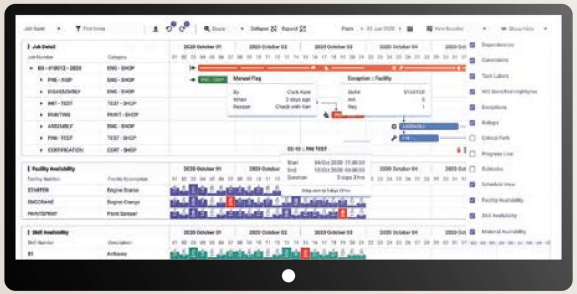
Veryon believes that employing an integrated MRO system that combines inventory management with maintenance scheduling helps to manage spare parts efficiently, even during supply chain disruptions. "But that is not always enough," says Purfurst. "An organisation will need complementary solutions that are integrated to help get you the insight you need and the gain you are striving for."

One of the key features within the Veryon Diagnostic solution is a guided troubleshooting module to help a less experienced workforce gain the knowledge they need to get an aircraft back to airworthiness status. While this does not solve the workforce shortage it can plug some gaps due to lack of experience.

▲ Ilari Neitola, founder and executive advisor, QOCO Systems

"SUPPLIERS IN THE SECTOR ARE CONFIDENT THAT INTEGRATED PLANNING AND SCHEDULING SOFTWARE HAS BECOME A 'MUST HAVE'"

1. QOCO Systems' MROTools.io Assignment package uses AI to match personnel to appropriate maintenance tasks
2. The Veryon Diagnostic solution is a guided trouble-shooting module



AI may get to do the heavy lifting before long. Ramco's Rajarajan says: "Intelligent automation and decision-making capabilities can reduce the highly intensive manual labour involved in planning, thereby improving productivity. For example, once the input work scope is given, the planning system should provide optimised sequencing of access panel tasks and MPD tasks, plus automated assignments of the rostered staff possessing the right skills for given tasks."

Another area where Ramco is leveraging historical data extensively is on non-routine effort and parts estimations during planning stages. This has significantly reduced order holds due to non-availability of manpower, parts and tools, claims the company.

PLANNING AND SCHEDULING SPREADS ITS WINGS

Looking ahead, even by 12 months, software suppliers see further change, with AI playing an increasingly pivotal role. Veryon envisages MRO/CAMO solutions will become foundational. "Complementary solutions that are fully integrated will provide insight, streamlining processes and decision-making. This will move the industry into a more condition/predictive base maintenance practice," says Purfurst.

QOCO Systems' Neitola also sees some broader reach. He explains: "We see planning and scheduling expanding into areas we may not have anticipated. However, even within the same domain, different customer environments will demand highly tailored solutions." He cites the Mixture of Experts (MoE) model as presenting a compelling opportunity here.

"This model allows us to create specialised, cost-effective AI solutions that can be fine-tuned to meet the unique needs of individual customers. An additional benefit of the MoE model is improved data privacy and security. By dividing tasks among different experts, sensitive information is handled more compartmentally, limiting data exposure," notes Neitola.

Such a structure allows experts to be updated independently, minimising the need to access full datasets and ensuring compliance with privacy regulations. This way, organisations can gain protection in their AI workflows while improving efficiency.

As these technologies evolve, QOCO Systems anticipates even greater efficiency gains and enhanced data security in an increasingly complex environment.

Ramco also sees planning creep as more sophisticated AI/ML algorithms are deployed alongside massive amounts of data. Rajarajan comments: "Planning software shall extend beyond the boundaries of the organisation, connecting ecosystems like suppliers and customers and OEMs and leveraging their data."

Ramco recently launched Aviation Software 6.0 for smarter aircraft management. The software leverages AI and ML to drive transformation in M&E and MRO operations. Rajarajan says: "The entire process of managing the kitting and marshalling operations is streamlined with the Kitting Hub; the automated planning takes into consideration the part demand data and suggests the possible options to meet the demand or highlight the risks."

Expect further software packages to hit the MRO market soon. Led by AI and ML, they are likely to lead to further systems integration – and hopefully better decision-making – giving MROs a more comprehensive view of maintenance activities, and how to tackle them earlier.

▲ Dave Purfurst, global pre-sales director at aviation tech company, Veryon

▲ Ramco maintenance scheduling