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An Insight into the World of Digital Management Solutions For Maintaining Aircraft Records

By David Dundas

There is no clear moment in time when the Digital Age began, but around the beginning of the 1980s, a time when the world wide web coincidentally appeared, we entered a new era of digitisation. According to Dr Martin Hilbert PhD., "We estimate the beginning of the "digital age" to be in 2002, when the world was first able to store more digital than analogue information in its technological tools. In the late 1980s, still less than 1% was in digital format, whereas in 2012, 99% of the world's stored information was digital. During these decades, the world's technological capacity to communicate and store information has grown 25% to 35% per year (doubling every 2.5-3 years)."

While the emergence of the digital era saw the development of many new businesses, it also presented the opportunity for many other existing businesses to streamline and improve the efficiency of their operations. This was especially so in the aerospace sector, and in particular the MRO environment. However there have been many challenges faced during this transitional period, primarily those involving the transition to paperless operations.

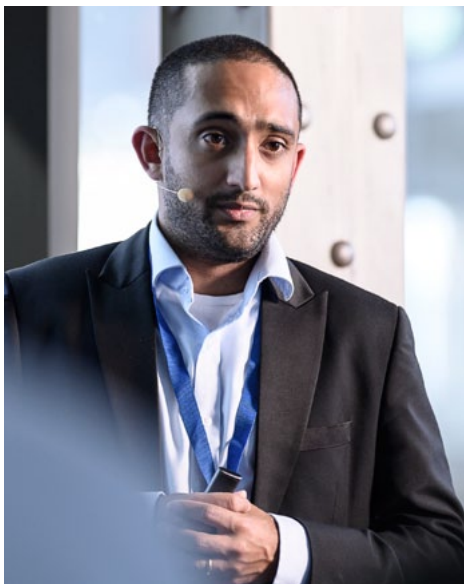
We were keen to understand how one particular aspect of MRO operations has transformed itself to embrace digital technology, the maintenance of aircraft records, and in particular how easy the transition from paper to paper-less operations has been. The following is tremendously inciteful information kindly provided by eight highly respected companies who operate within the field of digital management of aircraft maintenance records, whether as an MRO operator, or as a software developer.

Kris Volrath, SVP of Product, Veryon

Aircraft records. What they are and why they are so important

To begin with, we felt it would be useful to establish what was included in aircraft records and why these records were so crucial to the aviation industry. However, one fascinating comment was made by one of our contributors that highlights just how far the latest technology has influenced the creation of digital aircraft records. Records are no longer produced just by humans. Stephan Erben, Senior Portfolio Manager, Dassault Systèmes points out that there are also "Systems of records" which are "digital systems that primarily store data generated by various equipment embedded in aircraft, as well as produced by devices used during maintenance and inspection activities."

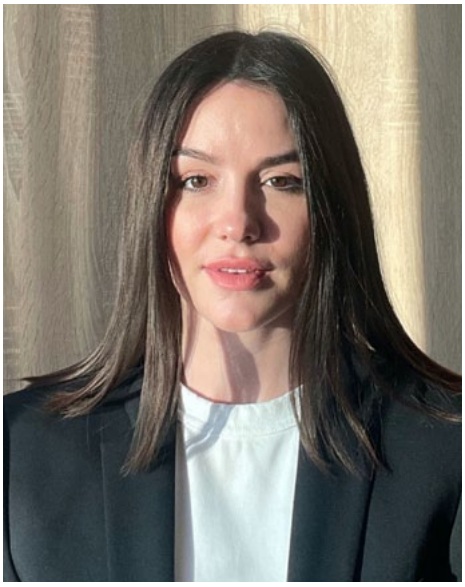
In general terms, we have been told that aircraft records are a comprehensive and continuously generated record of all operations and maintenance relevant to a specific aircraft, including maintenance, repairs, and inspections. Giovanni Renga, Chief Technical Officer at AMROS Global describes these records as being "similar



Joshua Sebastiampillai, Digitalization Manager, MTU Maintenance Lease Services

to a history book with all evidence of anything that was ever done on an aircraft," while Kris Volrath, SVP of Product, Veryon describes them as "the lifeblood of an aircraft."

However, these records are not just there for the MRO company's benefit. These records are also needed for proof of compliance with regulations, the aviation industry being one of the most heavily regulated of industries by the likes of the Federal Aviation Administration (FAA) in the U.S. and the European Union Aviation Safety Agency (EASA) in Europe, as examples. Even from the engine point of view, Joshua Sebastiampillai, Digitalization Manager, MTU Maintenance Lease Services points out that: "we can only talk about engine records. They either certify or build the basis of the certification that an entire engine, and each installed component, part and piece of hardware, is airworthy and can be used for flight. No engine or aircraft is allowed to be put into operation without them."



Kate Katrachenko, Customer Success Manager and Account Executive at Fluix

Kate Katrachenko, Customer Success Manager and Account Executive at Fluix is keen to point out one of the financial costs of failure to maintain accurate aircraft records: "Failing to maintain accurate records can lead to different consequences. For example, the FAA can impose civil penalties of up to US$400,000 per safety violation, while the EASA can issue fines based on the severity of non-compliance." Looking at the financial cost as well, but from the sales aspect, Navi Maharaj, VP, Head of Technical, The Aircraft Group, part of Kellstrom Aerospace Group makes it clear that: "These records are vital not only for ensuring the airworthiness of the aircraft but also essential for facilitating its sale and transfer by documenting its operational and maintenance history," while Jack Clancy, Product Specialist, REDiFly adds a further warning: "Inadequate records can lead to financial penalties, decreased aircraft value, and increased maintenance costs, directly impacting operational efficiency and financial health."

How the management of aircraft records has evolved over time

All our respondents talked about the transition from paper to paperless aircraft records, and this helped highlight three major improvements. With digital records, there is now less chance of records getting lost or damaged. Beyond this, there is far greater efficiency in the transfer of information and the speed in which it can be acted upon. The third point relates to how the records are produced as today, many elements within the latest aircraft have their own individual sensors that relay real-time data not only to those on board the plane, but maintenance teams on the ground who are responsible for keeping the plane airworthy.

Giovanni Renga, Chief Technical Officer, AMROS Global

> **"This evolution has been driven by technological advancement and the need for improved efficiency, accuracy, and compliance with regulations."**
>
> *Giovanni Renga, Chief Technical Officer, AMROS Global*

Giovanni Renga points out that: "This evolution has been driven by technological advancement and the need for improved efficiency, accuracy, and compliance with regulations," while Kris Volrath highlights a key moment in the transition from paper to digital record keeping. "In 2016, the FAA published Advisory Circular 120-78A, which outlines the requirements that must be met for an organisation to adopt a paperless maintenance compliance programme. The fact that the FAA has adopted and promoted maintenance tracking programmes and paperless compliance is the indicator of an industry shift toward a more functional and streamlined approach to maintenance and the compliance required." Of course

> **"Failing to maintain accurate records can lead to different consequences."**
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> *Kate Katrachenko, Customer Success Manager and Account Executive at Fluix*

> **"At The Aircraft Group, we offer consultative services to support both digital and paper record-keeping."**
>
> *Navi Maharaj, VP, Head of Technical, The Aircraft Group, part of Kellstrom Aerospace Group*

Navi Maharaj, VP, Head of Technical, The Aircraft Group, part of Kellstrom Aerospace Group

there is much more beyond the above. For example, "Computing power and artificial intelligence makes it possible to analyse massive amount of information, helping to transform unstructured content into structured information as well as to detect patterns or weak signals in gigabytes or terabytes of sensor data," says Stephan Erben.

There is, however, one thing that we shouldn't ignore when it comes to this digital transformation. Chris Kubinski, VP Worldwide Sales at CORRIDOR Aviation Service Software, a CAMP Systems Company reminds us of one important aspect: "I feel the human element will always be part of our processes, but the more we move forward with tools enabling us to work smarter, the better service we will be able to provide industry wide." Meanwhile Kate Katrachenko highlights a key element of this digital transformation at a time when carriers are doing all they can to minimise the overall weight of an aircraft to increase it's efficiency. "Traditionally, pilots carried 30-45 kg of paper manuals, checklists, and logs, which added unnecessary weight and clutter to the cockpit. By transitioning to digital records managed using lightweight tablets or mobile devices, airlines can reduce this number, which is always linked to cutting fuel consumption," she advises. We did some simple calculations as 45kg is roughly half the weight of an average male passenger requiring four litres of fuel to travel 100km. Thus, it would require two litres of fuel for the old paper logbooks and files to fly 100km. Now, if a commercial jet were to fly, say, 80 million kilometres in its lifetime of 30 years, those paper logbooks would have accounted for 1.6 million litres of fuel, the equivalent of 53,000 litres of fuel a year. And if you happen to be a carrier with a fleet of 100 aircraft, that's a lot of fuel!

Stephan Erben, Senior Portfolio Manager, Dassault Systèmes

Of course, not everyone has converted totally to keeping digital-only records, with Navi Maharaj pointing out that "At The Aircraft Group, we offer consultative services to support both digital and paper record-keeping. Our team of technical experts works closely with operators to ensure that critical details are accurately documented, including the management of aircraft and engine records, maintenance reviews, compliance with maintenance programmes, aircraft modifications and repairs, component tracking, and continuous record improvement." Giovanni Renga is also keen to highlight a couple of additional benefits of digital aircraft records, such as "enhanced data accessibility and transparency, and the reduction of many risks associated with transferring aircraft ownership and operator."

Jack Clancy sums up the current situation in a nutshell: "The evolution to digital records began with basic digitisation (scanning of paper records), and now encompasses advanced digital logbooks (eTechlogs) and maintenance software integrated with real-time data systems. For example, modern aircraft like the Boeing 787 and Airbus A350 utilise fully digital maintenance systems from inception, reflecting significant advancements in digital record-keeping."

A little about the technology used for digital management

This was perhaps where we had the most interesting replies as the technology is so new, relatively, that there is no single system or form of technology that dominates the space, save perhaps for eTechlogs or techlogs. So, this is very much an element of MRO that is still very much in the developmental stage, and it will likely be a good few years yet before the technology used for the digital management of aircraft records looks anything like standardised.

Stephan Erben talks about the time it has taken to shift from on-premises solutions to an SaaS model, stating that "More and more MRO companies are adopting integrated platform technologies that operate in an SaaS model, utilising private or dedicated cloud-based solutions as Software as a Service," adding that "This technology is well suited to work in an extended enterprise mode enabling operators to share in a controlled way the information between maintenance teams, regulatory authorities, and within their own organisation."

> **"More and more MRO companies are adopting integrated platform technologies that operate in an SaaS model."**
>
> *Stephan Erben, Senior Portfolio Manager, Dassault Systèmes*

Paper documents are history © *Shutterstock*

Navi Maharaj makes a very valid point regarding the abundance of tracking systems and MRO IT software, but that simple PDF depository sites also play a significant role in storing these records. He adds that: "At The Aircraft Group for instance, we developed an in-house digital records archiving and tracking platform called Tag Fleet Online. This platform, which we introduced several years ago, streamlines the management of digital records and significantly reduces the costs associated with aircraft re-deliveries and transitions." Giovanni Renga also points out a couple of additional benefits of digital aircraft records, such as "enhanced data accessibility and transparency, and the reduction of many risks associated with transferring aircraft ownership and operator."

Not so long ago 'blockchain' technology was flavour of the month, and you could rarely pick up any 'tech news' without reading about numerous doors being opened by this new technology. That technology is too recent to be confined to the history books, yet it has been completely overshadowed by developments in the field of Artificial Intelligence (AI). Jack Clancy appears not to have taken his eye off the ball as he includes blockchain technology in his list of key technologies used in digital aircraft record management, including "cloud computing, which allows for scalable storage and global accessibility; blockchain for secure and immutable record-keeping; and Optical Character Recognition (OCR) technology to digitise manual entries with high accuracy. Additionally, software platforms provide comprehensive maintenance tracking and inventory management, which are integral to modern MRO operations. Digital solutions like the eTechlog can also be connected to push and pull data from those systems. Leading to digital records from day one and an integrated seamless workflow."

Meanwhile, while Kris Volrath lists 'the usual suspects' among the latest technologies used for creating digital records, he also touches on a real game-changer resulting from the use of these technologies. "Veryon Tracking provides a fully integrated solution for real-time visibility into data across departments. It enables seamless capture and updating of maintenance records from any location—whether in the hangar, on the flight line, or at the office. Maintenance issues can be tracked, and fleet health can be monitored in real time. The platform offers instant visibility into total aircraft times, upcoming maintenance items, discrepancies, logbooks, and work orders, all accessible from a single, user-friendly dashboard."

When looking at these technologies as a whole, it is clear there are other unmistakable benefits, as mentioned by Giovanni Renga. "These technologies help in digitising, indexing, and archiving maintenance records, ensuring seamless integration with existing systems and data analytics for predictive maintenance."

So how does digital record keeping enhance operational efficiency?

Where do you start? The transformation of record keeping is almost as dramatic as the introduction of the world wide web to the dissemination of information across the globe. However, Navi Maharaj hits the nail squarely on the head with one crucial improvement when he comments that: "The significant operational efficiency I see is the ability to never lose a document again, as everything is stored in digital format rather than in filing cabinets, from

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Jack Clancy, Product Specialist, REDiFLY

> **"We have seen how implementing an eTechlog system can significantly enhance operational efficiency for air operators and MRO providers."**
>
> *Jack Clancy, Product Specialist, REDiFLY*

ensuring full transparency and accuracy to instant access to vital data related to the airworthiness of the aircraft, reducing human error and mitigating the risk of non-compliance disruptions."

It is clear that digital record keeping is capable of reducing the time and effort needed to maintain essential data. It has also streamlined and massively reduced the amount of time required to analyse all that data and as Kate Katrachenko points out, "pilots can [now] submit completed maintenance forms before they leave the cockpit, allowing engineers to start their work right away. This can minimise aircraft downtime, speed up maintenance tasks, and cut out repetitive manual work, which can delay flights or extend maintenance times."

Giovanni Renga is one of a number who have pointed out that 'managing' is something that many operators have struggled to do with aircraft records. "Currently with the analogue means, aircraft records are actually barely "managed" in the industry, creating a long chain of reaction of critical issues related to airworthiness and asset value. Digital aircraft records keeping finally gives us the tool at hand to deal with the vast amount of aircraft records in an efficient and effective way, facilitating quicker decision-making, reducing aircraft downtime, avoiding redelivery delays, track records issues and streamlining compliance processes." Chris Kubinski also touches on a new facet of digital management solutions which one could describe as akin to 'multitasking', as he comments that: "When managing records digitally, you have the ability to easily manage multiple items at once. This leads to efficiency gains throughout the process, from initial planning and staging of work to be performed, to capturing electronic signatures of technicians and inspectors during the job, to an expedited return to service for the aircraft."

The ability to map operational information from the aircraft and in-service activities ("real") to the specifications, failure modes, and reliability studies defined for each system and subsystem in the context of each aircraft ("virtual") enhances operational efficiency in the three key areas of improving asset reliability, supply chain availability, and reducing mean time to recovery. Stephan Erben also states that these improvements benefit Maintenance, Repair & Overhaul (MRO) Providers and Original Equipment Manufacturers (OEMs), operator owners and airlines. In addition to the above, Kris Volrath sees improvements in operational efficiency through improved access and operational visibility, enhanced data accuracy and integrity, streamlined workflows, improved decision making, enhanced compliance and cost reduction.

"One big advantage of using digital record keeping is that the documentation is readily available in our archives on short notice, whereas traditional filing systems using binders and stacks of paper is a much slower retrieval process. This is especially true during engine transition processes, when it is costly to keep assets on the ground while documents are being exchanged. Amos and Trax are examples of maintenance and engineering systems that airlines use to digitally track their documents," commented Joshua Sebastiampillai, while also bemoaning the problems encountered by many where analogue records are concerned.

In addition to increasing efficiency, Jack Clancy also touches on the cost of storing paperwork associated with analogue records: "At REDiFly we have seen how implementing an eTechlog system can significantly enhance operational efficiency for air operators and MRO providers. This approach promotes digital record keeping and reduces the time required for retrieving maintenance records while eliminating the costs associated with storing physical documents. Furthermore, the accuracy of maintenance logs is greatly improved, allowing for quicker access to an aircraft's maintenance history. This streamlining leads to more effective planning of preventative maintenance, reduction in aircraft downtime, and overall operational cost savings while ensuring higher availability and reliability of aircraft for operations."

Challenges faced when transitioning from analogue to digital platforms

It goes without saying that training has to come close to the top, if not at the top, of the list as paper record keeping is appreciably different to the system of maintaining digital records. Trying to break 'the habit of a lifetime' for many who have worked in the industry for thirty-plus years has to have been a huge challenge, and vestiges of this problem may still remain. However, there is also the problem of converting mountains of analogue data into digital formats, primarily through scanning. CORRIDOR Software's Chris Kubinski adopts a positive stance, pointing out that "for legacy and especially smaller aircraft, many of those owner-operators rely on their paper documents. Many companies now provide this as a service to help facilitate the industry digitalisation effort."

At Dassault Systèmes Stephan Erben concurs with the problem of long-term employees who are used to the paper trail of an analogue system struggling to adapt but feels that a sufficient number of younger-generation employees are coming into the business, and they will naturally adopt the newer digital way of doing things. "As businesses move toward digital transformation, paper-based processes become less appealing, especially for the new generation of employees who are accustomed to digital tools and expect

more streamlined, adaptable, and eco-friendly solutions," he says.

Fluix' Kate Katrachenko also picks up on companies' 'resistance to change', together with the complexities and risks involved with transitioning from one system to another, particularly when "they need to ensure that their new digital system complies with regulations for record keeping and audits, or they risk penalties and fines," she says, adding that "digital solutions can require a significant initial investment. This includes purchasing new equipment like tablets or mobile devices for flight crews, acquiring the necessary software, and dedicating resources for onboarding and training. It can be a significant decision-making blocker particularly for small airlines." Joshua Sebastiampillai at MTU Maintenance has the same concerns with regard to compliance, advising that: "When an engine goes through a shop visit, all procedures that have been conducted on it have to be recorded and signed off by the technicians, line inspectors and certifying staff, so it will be necessary to digitalise the tasks within workscopes in such a way that they adhere to official airworthiness requirements."

While agreeing with much that we have already covered here, Jack Clancy at REDiFly also points out the security implications of transforming from analogue to digital records, advising that: "integrating new digital systems with legacy platforms without disrupting existing operations can be complex. Businesses also face data security concerns, ensuring that digital records are protected against unauthorised access and cyber threats." For those businesses looking to make the transition, Kris Volrath at Veryon offers sound advice to opt for "a company that provides both the digital platform as well as resources dedicated to managing the extraction, migration, and review of all the aircraft's data. Another challenge is the mobility and accessibility of digital records and software – technicians need the ability to access in remote areas, on their mobile device – anytime, anywhere." He then points out that: "For example, at Veryon we provide both the underlying software platform, as well as the necessary services, personnel, and tools to expedite the transition for our customers and make both onboarding to the software platform as well as the transition from paper to digital as seamless as possible." Giovanni Renga at AMROS Global puts it very succinctly when it comes to transitioning to a digital records system. "Digital records tools should be plug & play, easy to use and companies onboarded with ease."

The integration of existing systems with digital management solutions

It is not so much a problem, but more a change in operational procedures as the transformation to digital aircraft records opens up a whole range of additional opportunities for digital tools to monitor the 'health' of an aircraft and its engines that were not an option with analogue record keeping. Unfortunately, there is a current stumbling block to the level of success achieved with transitioning from analogue to digital aircraft records. "There is a specification (SPEC2500) that the industry is supposed to use to transfer data between one company and another. However, a pain point is the lack of adherence to that," comments Joshua Sebastiampillai.

Potentially, digital management solutions can integrate with MRO software and aviation safety systems, depending on the solution itself while technically, there are two main types of integration. Kate Katrachenko expands on this: "Firstly, in-house integrations that are built directly into the software by the vendor. These integrations are pre-configured and don't require additional setup. Secondly, there are Webhook or API integrations which are more flexible and customisable options. Through APIs, digital management solutions can integrate with a range of other tools, like inventory management, compliance systems, or even scheduling software. Webhooks are event-driven connections. When something happens in the digital management system (e.g., a pilot submits a journey log), the webhook triggers a notification or action in another system."

Stephan Erben explains one of the key factors relevant to the integration of analogue and digital systems: "Today, digital management systems primarily utilise knowledge graph technologies, where information from existing systems (referred to as legacy systems) is mapped onto an ontology." He points out that these new architectures offer several benefits: "Each legacy system remains the sole source of truth and the place where changes are made, data integration

Chris Kubinski, VP Worldwide Sales, CORRIDOR Aviation Service Software, a CAMP Systems Company (CORRIDOR Software)

frameworks manage the communication and exchange of massive amounts of data, bridging the gap between different data sources to create a cohesive, up-to-date knowledge graph view, information from all siloed legacy systems is consolidated into a single view, enabling seamless data exploitation while masking the complexity of the underlying technology, and data is projected onto ontologies, facilitating analysis by accounting for variations in meanings across siloed systems."

Meanwhile Navi Mahataj adopts a more cautious tone: "MRO IT software / Maintenance tracking systems today can be easily adapted, as programming languages have changed over the years to mitigate the gatekeeping associated with proprietary software. However, integrating with older legacy software can be troublesome, thus creating errors." However, Chris Kubinski is slightly more pragmatic on the subject. "A good digital management solution will work in concert with the common platforms in use by that aircraft's service network. Ideally, a series of bi-directional interfaces should be available among systems so that users throughout the process are able to see the relevant information required for their specific actions - without jumping from one system to another. A spreadsheet exchange doesn't cut it."

Jack Clancy concentrates more on the integration of two digital records systems, advising that: "Digital management solutions typically integrate through APIs that allow different software systems to communicate and share data effectively. For instance, an eTechlog might integrate

with an air operator's existing MRO software, ensuring that data about maintenance activities is automatically updated and available across systems, enhancing the efficiency and reliability of data used for making operational decisions." In turn. Kris Volrath points out that companies can unlock seamless workflows and amplify productivity by integrating their aircraft maintenance records with other systems in their operating ecosystem. "For example, integrating real-time maintenance records with flight planning and scheduling systems provides a comprehensive view of an operation. Veryon ensures a smooth transition with our dedicated implementation team, advanced data extraction, and import tools."

Finally, Giovanni Renga advises us that: "Today, digital management solutions integrate with existing aviation systems such as Maintenance & Engineering or electronic maintenance logging systems through APIs, creating workflows and automation that is sheer impossible to perform with current analogue processes. These solutions are designed to work seamlessly with maintenance tracking software, flight operations systems, and regulatory compliance tools, ensuring cohesive records management and minimising risks of non-compliance vs contracts, manufacturers and authorities."

How companies can ensure the security and integrity of their digital aircraft records

For many businesses, the corruption of data can be an inconvenience. It can briefly disrupt operations, but rarely does it result in any real risk to life. While there are legal requirement for the protection of data, seldom are companies fined for any form of data breach. Beyond that, it is more inconvenience that anything else and within a few days, if not hours, the business can be fully operational again with nominal repercussions. Nothing could be further from this scenario than a data breach involving aircraft records. The consequences are at best described as a ripple effect similar to throwing a pebble into a millpond, though in this instance it might be more appropriate to describe it as a rock!

As a consequence, safety and integrity of digital aircraft records are paramount, and Stephan Erben goes into considerable depth to explain how that can be achieved: "Security of digital records is ensured through different ways: For critical data, records are stored on devices equipped with encryption capabilities. In sectors like Aerospace & Defence, where operational data or highly sensitive information is involved, these devices are kept offline and are not connected to any network. Access to this information is tightly regulated, undergoing a process of anonymisation, filtering, and thorough checks before being transmitted to a digital platform utilised at the corporate level. For sensitive data, information is "flagged" with different levels to ensure proper handling." He advises that the following list is not exhaustive but that it is commonly used in the Aerospace & Defence sector: "ITAR (International Traffic in Arms Regulations), which governs the export, import, and handling of defence-related articles and services, including technical data that is considered critical to national defence, EAR (Export Administration Regulations), which regulates the export of commercial and dual-use items, including technology and software. It applies to items not covered by ITAR but still sensitive for national security, foreign policy, or economic reasons, CUI (Controlled Unclassified Information) is tagged to information that is not classified but still requires safeguarding or dissemination controls in accordance with laws, regulations, or government policies, and Classified Information (Confidential, Secret, Top Secret) is for data that is considered vital to national security."

Joshua Sebastiampillai advises: "Safe storage of engine records is, of course, paramount, so beyond using protected servers and proper permission-based handling of digital files, companies need to have redundancy measures in place. Back-ups of digital data are extremely important if a company uses cloud-based technologies to store data, for example," and Jack Clancy further elaborates: "To protect digital records, companies should implement robust cybersecurity measures, including encryption, secure user authentication protocols, regular security audits and compliance with standards like AC120-78A. Compliance with international standards like ISO 27001 for information security management is also crucial. The recently introduced EASA Part IS (Information Security) regulatory framework also places a focus on cybersecurity for operators in Europe and beyond. Regular backups and the use of redundant systems can ensure that data is preserved and accessible even in the event of a system failure."

"Companies should work with organisations that have a multi-faceted strategy and commitment to safeguarding the security and integrity of digital aircraft maintenance records. For example, adherence to ISO standards, such as ISO 9001:2015 for Quality Management and ISO 27001:2013 for Information Security, ensures compliance with industry best practices. Additionally, the organisation should continually invest in security practices, including regular updates to security measures, such as multi-factor authentication and optional single sign-on, to enhance access control. Furthermore, redundancy and resilience in case of data loss or system failures are paramount," says Kris Volrath. By combining these elements, this demonstrates a strong commitment to safeguarding sensitive data, contributing to a secure and reliable environment for managing digital aircraft maintenance records.

The role of AI in maintaining digital aircraft records

AI plays an increasingly significant role in enhancing data analytics and interpretation, as well as automation. For aircraft records, this means things like automated document type recognition, automated sorting into specific standards or the analysis of document contents for data accessibility and compliance, which can provide unmatched time savings and accuracy increase, which with analogue processes cannot be obtained. As Giovanni Renga puts it, "we are just at the start with AI, so it can be generally recommended to adopt digital records systems sooner rather than later," with Navi Maharaj concurring on the ability for AI to speed up processes as he advises: "AI plays a significant role in maintaining digital aircraft records by enabling companies to search records faster and the ability to recognise and digitise historical handwritten data. Its integration will streamline processes, reduce human error, and significantly reduce manpower."

AI has significantly evolved in the last few years with the introduction of Large Language Models (LLMs), demonstrating

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their ability to transform semantics into numerical vectors and generate content in natural language. One of the initial limitations, due to the cost overhead of retraining the models, was quickly addressed with the development of Retrieval Augmented Generators, allowing content to be leveraged without the need for model retraining. The second limitation, which makes it more challenging to use LLMs for industrial purposes, is the risk of generating hallucinations. The recent concept of agentic workflows is helping users interact with LLMs and instruct them in executing complex tasks, thereby improving accuracy and reducing the generation of factually incorrect information.

Stephan Erben explains further: "Although the use of AI has not yet reached the expected level of maturity for full industrialisation, there are several use cases where it already provides significant value. It is important to focus on scenarios where humans remain in the loop. LLMs will be instrumental in analysing the unstructured content of most aircraft record information sources, transforming it into model-based structures. The usage of Machine Learning and Deep Learning models is supporting experts in detecting outliers and weak signals within large volumes of data."

Joshua Sebastiampillai takes a more cautious and pragmatic approach to the role of AI. "As in other parts of MRO, artificial intelligence has a huge potential to simplify processes, including the creation and keeping of records. However, the MRO industry still has to develop much of the technology that would be able to scan, assess and assign the information from a non-incident statement, or back-to-birth history, or other records that may have or may not have standard formats. And they likely have to be developed in-house," he comments.

AI can enhance the management of digital aircraft records by automating data entry, predictive analysis for maintenance scheduling, and anomaly detection in record entries which might indicate potential issues. AI can also analyse historical data to optimise maintenance cycles and parts inventory, reducing costs and improving operational efficiency and Jack Clancy provides an excellent example. "AI algorithms can predict when specific components will require maintenance well before traditional methods would flag them, enabling proactive maintenance and reducing unscheduled downtime."

To end the topic, Kris Volrath looks at the current role and future potential of AI in maintaining aircraft records. "Veryon fundamentally believes that AI will continue to play an important role in the transformation of aviation maintenance across the industry, but also must be leveraged carefully to ensure safe and reliable operations. We see AI already playing important roles in assisting mechanics with troubleshooting and maintenance of aircraft while in strict compliance with the technical publications of the manufacturer, but we also envision a future where AI and machine learning can better assist, direct, and predict maintenance in the future."

In conclusion, it would seem that technological advancements in the way aircraft records are created and recorded, transforming systems from analogue to digital operations (paper to paperless) has many clear advantages, but such advancements clearly still come at a cost. New skillsets are required and those who have operated under the old analogue systems are always going to be reluctant to adopt a far-from-subtle change in the way they have to record events and obtain their instructions/work programmes. Beyond that we have the logistical challenge of converting much of the original analogue content into digital format as with a lifespan of roughly 30 years, how do you present the records of a 25-year-old jet to a prospective buyer? Do you provide both paperless and paper documentation? Finally, among other things, there is the question of security and how you successfully protect the integrity of aircraft records, without which any plane's value and safety profile will be severely and perhaps irreparably damaged.