

With the demand for reduced check downtimes, increased billing accuracy, and a more efficient workforce, the latest Maintenance & Engineering software package and mobile connectivity applications are helping MROs to run a more profitable business.

Connectivity applications in MRO

Heavy maintenance operations from the point of enquiry to the post-check invoicing stage require a large amount of data management.

Traditional paper-bound constraints of antiquated aircraft maintenance procedures at maintenance repair and overhaul (MRO) facilities have now been reduced or delimited by evolving software and systems. This creates improved connectivity to their central content management systems (CMSs), along with real-time data entry and analysis through their chosen host maintenance and engineering (M&E) IT systems.

To further update existing legacy computing systems, MROs have a choice of connectivity applications and equipment to tackle the challenges of running aircraft maintenance facilities as a profitable businesses. The current M&E connectivity software, digital formats and information standards along with IT tools for integration requirements are evaluated here.

Connectivity

Connectivity is not just about the ability to access and receive information digitally, nor is it just about new technology advances in equipment for mobile and handsfree data capturing. Connectivity also covers the need for the communication and integration between internal and external business IT infrastructures. Whether this is via the web, a private Cloud, WiFi, or 3G or 4G cellular network connections, the industry is now focusing on integrating with ease between the old (legacy) and new IT systems to exchange information.

MROs will have business management software, often referred to as enterprise resource planning (ERP), in place to collect, store, manage and

interpret data from many business activities. For an MRO, this information is handled by a chosen host M&E programme that will cover the internal departments like commercial, planning, production, stores, quality, and finance.

Within an MRO's M&E system, the choice of connectivity system can vary. The constraints of geographical location, building infrastructure, business size and market needs all have to be considered.

Whether the host system's server is on site, or is accessed through the web, signal speed and information storage capabilities along with future adaptability are all important. Nick Godwin, managing director at Commsoft, the developers of the OASES Engineering and Maintenance Software System, explains: "The use of any modern MRO IT system is subject to minimum specifications of connectivity and processing speed, whether via physical networks or wireless means. These minimum specifications constantly change as greater functional demands are placed on systems such as OASES, particularly in areas of data storage and data transfer."

"Any MRO upgrade to take a new IT system will plan for likely growth in its infrastructure design," continues Godwin. "Most large organisations will virtualise the OASES application over its network, sharing resources with other IT systems. Smaller organisations choose to buy dual standalone servers, with OASES installed uniquely on these. In both cases, the disk capacity may need to grow with increased use. Wireless systems are easier to grow rapidly, since they do not need extensive physical installations."

Content Management Systems

CMS services can be provided by original equipment manufacturers (OEMs) or by independent providers.

Revisions to OEM material are kept up to date via OEM CMSs, like the Boeing Performance Toolbox and the Airbus ADOC products.

Obtaining access to the current information, such as the latest Aircraft Maintenance Manual (AMM) or the Illustrated Parts Catalogue (IPC) is critical for MROs. For the OEMs, return information from MROs for such occurrences as service bulletin (SB) findings and reliability reports are just as important.

Instant, accurate and user-friendly content is needed for efficient and competitive aircraft maintenance operations. Information from the OEM needs to be matched to the individual aircraft being worked. Every aircraft manufactured has a specific serial number and/or line number that manuals and parts catalogs are cross referenced to. For MROs maintaining a varied combination of aircraft fleet ages, types, and configurations, handling CMS-specific information through an M&E programme is key to even attempting to handle the various document formats and standards to be integrated into their business processes and IT programmes.

M&E Systems

For MROs, M&E systems provide a core repository in which to store, analyse, and record the manuals and original data provided by the OEMs or CMS. M&E systems, along with capturing information from their own 'in-house' business programmes, also provide the interface with the latest mobile applications and hands free devices.

MROs need to consider many issues when updating core or host M&E systems and all of their associated point solutions. Most IT solutions come in modules or packages that are bolted on

to the current infrastructure already in use, to enhance the existing software or introduce new capabilities within the MROs operation. Newly adopted M&E programmes will often need to 'bend' to fit around pre-existing ERP software and procedures.

For lessors it is important that they have a more standardised M&E system in place. The post-lease transfer of an aircraft between operators mostly happens within third-party MRO facilities. The flexibility needed to handle various document formats for data interchange post-check can be time-consuming and difficult when opposing IT systems cannot connect.

Digital information

MROs are continually striving to achieve improved information exchange, faster and more predictable turnaround times, and optimised use of labour and materials handling. This is all required while they are still working within the constraints imposed by the existing regulatory environment and also, importantly, satisfying the demands of the MROs' customers and supply chains.

To obtain the full benefits of interconnected OEM and M&E IT systems, embedded information must be seamlessly exchanged between document

types throughout the aviation industry. As technology improves, and more players step into the M&E management area, a greater need is developing for IT systems to be able to integrate information between alternate formats.

File types

Data can come in several formats, including standard generalised markup language (SGML), hypertext markup language (HTML), portable document format (PDF), and extensible markup language (XML) formats. What the M&E supplier and OEM use, and how they use it, affects the interfacing of the systems and the work involved in receiving and sending data.

Intelligent documents allow users to search, find and navigate through the information due to its 'marked-up' or tagged content. Markup languages are designed for the processing, definition and presentation of text.

SGML was developed in the 1980s by the International Organization for Standardization (ISO) in an attempt to tackle the many competing formats and their embedded nature. SGML is not in itself a document language, but a description of how to specify a document markup language or tag.

By the 1990s HTML was created by

the World Wide Web Consortium (W3C) for use on the web. Web browsers can read HTML files and render them into visible or audible text for web pages. HTML describes the structure of a website semantically (in terms of its meaning), along with cues for presentation. HTML in general provides a presentation layer. HTML5 is the latest version released on 28th October 2014.

By the late 1990s, a solution was required that would allow for greater exchange of information. XML was then developed by W3C and contains a markup language that defines a set of rules for encoding documents in a format which is readable by computers and people. It is flexible and easier to manage, while having more capabilities for different systems to understand and connect to it. XML allows for easier manipulation and 'parsing of the semantics'. In computer technology, a parser is a programme that receives input in the form of sequential instructions, interactive online commands, or markup tags that can then be managed by other programmes. A parser may also check to see that all necessary inputs have been provided.

For PDF formats developed by Adobe Systems in the 1990s, each file contains a complete description of a fixed layout flat document. This includes all information

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that is needed to display it including fonts, text and graphics. This is still the primary way for viewing files within an MRO.

Information standards

Once file formats were developed, a need to standardize the data was required. Airlines for America (formerly Air Transport Association), in partnership with other international airlines and equipment manufacturers, established and maintained information standards and specifications for the contents, structure, and exchange of electronic aviation maintenance documentation. These standards are now developed and maintained by the ATA e-Business Program, under the auspices of A4A.

One of the most widely adopted specifications ATA iSpec 2200, first published in 2000 incorporates the previous ATA 100, for the chaptering structure of information, and Spec 2100 which focused on electronic data exchange implemented by SGML. iSpec 2200s objective is to minimize cost and effort needed by Airlines, OEMs and MROs by creating a standard model for the digital representation and exchange of structured technical data.

A further specification, S1000D, was developed by the AeroSpace and Defence

Industries Association of Europe (ASD) and based on ATA Spec 100. Currently it is jointly produced by ASD Aerospace Industries Association of America (AIA), and the ATA e-Business Program. S1000D initially provided only SGML DTDs (Document Type Definitions). DTDs define the documents structure with a list of legal elements and characteristics. Just like many other structured data standards, however, as XML began to take hold, newer versions of standards began to evolve to include first, XML DTDs, and then eventually XML Schemas. When using XML for example, S1000D outlines a way to break down technical publications into self-contained information units ("data modules") which can be marked with individual XML labels and metadata. Metadata helps organize and provide digital identification of electronic resources. This permits the updating of single data modules so they can therefore be managed and published more efficiently and, if necessary, shared among multiple publications.

Depending on when aircraft were manufactured, aircraft documentation will conform to different standards.

ATA e-Business Program

Although industry demand has meant

that most of the information providers at least pay attention to the standards outlined, guidelines are not always followed precisely, leading to difficulties for system integrators.

The huge array of existing IT programmes in operation today needs to adapt to the latest standards where possible, especially for legacy systems that have been in service for many years.

The ATA e-Business Program combines the vision to allow seamless exchange and availability of digital information, along with the mission to provide a benchmark for information standards to the aircraft industry. Brad Ballance, senior managing director of e-Business, explains. "From the publication of ATA 100 in the late 1950s through to the most recent iSpec2200 and S1000D specifications, we have had standards for maintenance planning and procedures, including documents and corresponding data formats for maintenance planning documents; aircraft, engine and component maintenance manuals; wiring manuals; and other similar data sets.

"Using these specifications, standardised information has been provided from the original equipment manufacturers (OEMs) to the operators for many years. The biggest changes in this area, however, are the ability to use the data formats to populate new

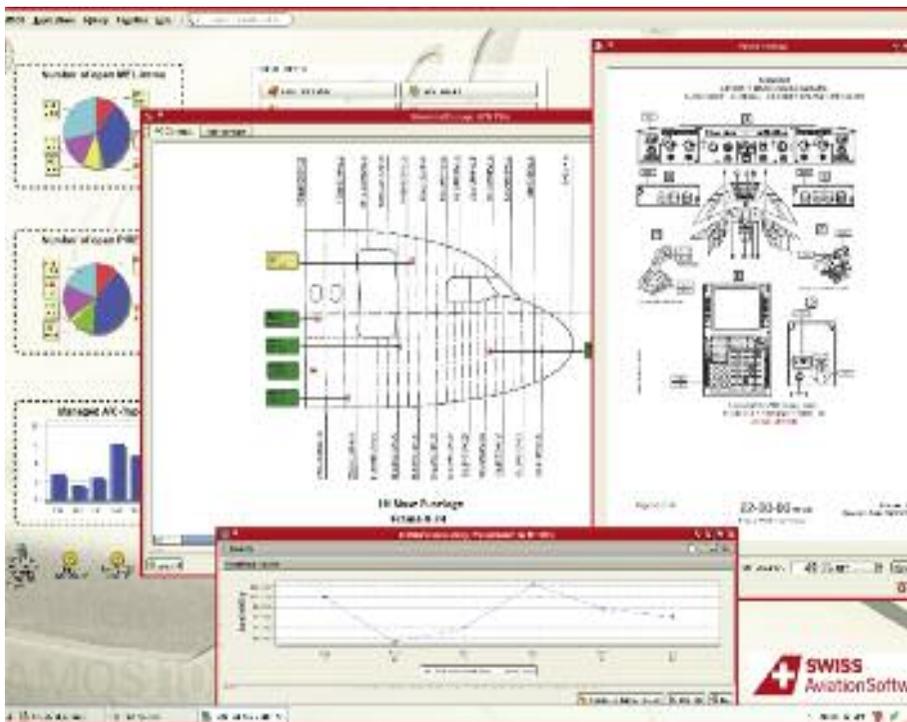
AMOS

A Story of Success

"Swiss-AS was highly committed to this implementation project and did its utmost to make this project a success", says Finnair.

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maintenance tools and software products to facilitate the maintenance processes,” continues Ballance. “The ATA e-Business Program has many software companies participating in the development of these standards and specifications, but more is always needed. Often, the end users (both producers and consumers) of the information need to be aware of the existence of S1000D, Spec 2000, iSpec2200 and even Spec 2300 (for flight operations) and encourage adoption by the big M&E IT systems providers. There is a varying level of standards compliance among the different software packages, but more will benefit the end users.”

The Program consists of more than 115 companies; operators, lessors, manufacturers, MROs, distributors and software providers which work together to develop industry information exchange standards related to maintenance, engineering, material and flight operations. “Within those disciplines, we have a number of working groups and project teams focused both on enhancing existing published standards, and developing new ones,” continues Ballance. “The focus is on company-to-company and/or system-to-system information exchange. Since systems are the primary creators and recipients of the data, it is important to develop formats and definitions of all the fields to ensure all the participants have the same understanding.”

Besides the technical information provided by OEMs to the operators, the ATA e-Business Program develops and maintains many other standards used in M&E operations in the areas of electronic procurement, operational and reliability data exchange, electronic technical logbooks, warranty data

exchange, radio frequency identification (RFID), and electronic formats for some regulatory documents such as 8130-3/Form 1.

IT Tools in use

There are many M&E management and solution IT software programmes available to MROs to use providing connectivity within an MRO. The difficulty can be selecting the solution that not just fits the MRO, but is also adaptable to the customers using the MRO. Many airlines using third-party MROs, for example, have their own host IT software that will need to interact with the MROs. Automating the maintenance check processes electronically as much as possible through a combination of connectivity and software programmes is critical for such transfer of information between the parties involved. Paper records always requires a considerable amount of labour to manage. To add to this, if full automation of technical documentation within the MRO is desired, then the M&E and its CMS systems ideally need to be synchronised. So that the latest version of the AMM in the CMS for example is used by the MRO when preparing for a check within the M&E system.

What must be remembered is there also two distinct areas of use of MRO IT systems. The airlines’ use of an MRO IT system is quite different with its emphasis on actively controlling an aircraft’s airworthiness compliance in high intensity daily operations. While an MRO concentrates its energy in blocks of significant work around heavier base checks with the emphasis on production controls, margins and commercial

Connectivity to OEM-supplied maintenance data through M&E software packages allows a large amount of information to be instantly at the user’s fingertips.

management.

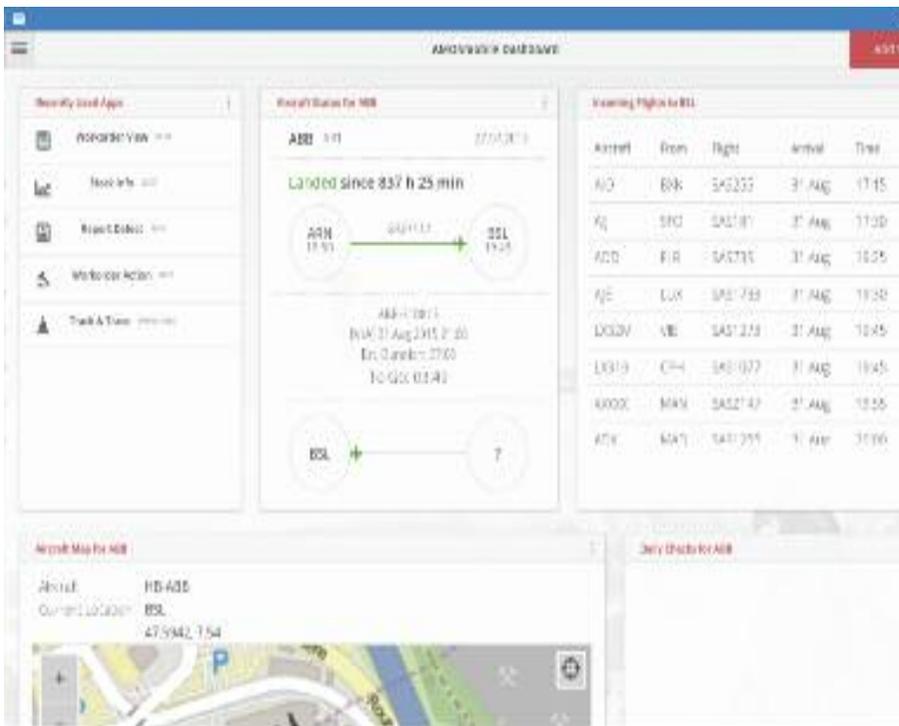
“It is Commsoft’s view that MRO IT and associated systems are like a ‘glove’ fitting the ‘hand’ of each MRO’s or airline’s requirements,” explains Godwin. “All systems have strengths and weaknesses for different categories/sizes of aviation user. The fit of the ‘glove’ depends on various factors, including growth rates, aversion to risk, budgetary capacity and other factors that make up each organisation’s constantly evolving IT ‘journey’. Because there are many different systems which have different fits to each organisation’s requirement, this makes standardisation universally quite challenging, but most efforts have been addressed at using universal exchange formats, such as XML and SGML. It is a challenge for any supplier, airline or MRO to keep abreast of this constant multi-track evolution. The leasing companies have also created ‘bibles’ for data exchanging between airline customers and MROs. Commsoft is keeping track of these trends and responds to each of its customers with affordable customised interfaces, while also looking to enhance generic exchanges with OEM manufacturer systems.”

The OEM data requirements for an airline and MRO also differ quite significantly. There is an increasing trend towards OEMs providing data services (manuals, parts information, instructions) which are embedded in their aircraft offering as the OEMs have a need to gather product information at source to accelerate aircraft or component maturity and reliability. The formats used by OEMs to do this are quite different and an MRO IT system must remain flexible to exchanging such data and being agnostic to any OEM source.

Infrastructure choices

Maintenance organisations have to be clear what additional systems can be handled by their M&E systems, to optimise their maintenance operations. There are several issues to consider in relation to hardware and infrastructure for useful connectivity. The exact choice of hardware depends on how the entire system communicates.

One of the cost-saving infrastructure services implemented by M&E providers



To assist user interaction, new 'dashboard' screens on handheld devices help to only show important and relevant information.

is the software as a service (SaaS) technology approach, used to deliver the benefits associated with one or more applications directly to a customer across the internet. Oracle Cloud Computing is one company offering this approach, which is used by many M&E system vendors.

For an MRO, eliminating the need to install and run applications on its own 'in-house' servers can bypass the maintenance operation and support costs associated with the more traditional server-based point-of-use systems. It can significantly reduce the software complexity and purchase, hardware set-up, and maintenance expenses by allowing companies to host licensed products with a third-party application service provider (ASP) such as a Private Cloud.

A small amount of connectivity is sufficient for any option that is web-based.

"The Private Cloud has been established primarily to offer access to smaller organisations without significant internal IT resources," explains Godwin. "Commsoft provides access to OASES via Windows remote desktop protocol (RDP), which is hosted on servers in UK data centres, offering comprehensive data security and associated back-up facilities."

"Operators save significant investment in local server hardware and IT support resources, which together with a flexible licensing regime can allow much lower access costs, with services accessible via the internet," continues Godwin. "Initially, a saving in support team salaries will be made, which could deliver savings of \$15,000-25,000. There could then be recurring salary savings.

There could also be savings relating to the server and back-up media. The use of RDP would also allow access from any location with internet access."

For 'in-house' connectivity while working within a facility, a WiFi signal, for example, will be appropriate for an MRO's own internal networking. Cellular connections can be used for remote access, as well as for connectivity between handheld devices and the host network. Connection speeds would have to be assessed carefully due to the environmental issues of covering the physical size and open plan layout of the hangar and maintenance area. Signal range and strength to reach within the aircraft's fuselage, and be usable by a large quantity of workers, would be a case-by-case evaluation, depending on the application it is needed for. The minimum requirements for WiFi connection to some handheld devices for transmittal of inspection instructions, for example, is 1MB/sec with a direct link to the server.

Additionally to assist remote connectivity to an internal network at a MRO base, a virtual private network (VPN) can be used to extend a private network across a public network like the internet. This enables users to send and receive data across a shared or public network as if their computing devices were directly connected to the private network.

M&E systems

Costs are a big consideration, not only in evaluating infrastructure, but also the capability of the M&E system. Software comes in packages to cover the different operational and functional aspects of the MRO's departments. What

suits each individual business, especially for non airline-supported MROs, needs to be evaluated carefully to consider the integration costs, and the return in the investment time scale. This can be often be referred to as the 'economy of scale'.

Some M&E system vendors incorporate the entire maintenance organisation as one integrated process, with the objective of driving a greater predictability in the control of the aircraft maintenance activities as a business. Other M&E providers offer bolt on modules or packages to existing legacy systems. Most M&E systems will not be used to perform all financial management functions. This requires the M&E system to be integrated with more comprehensive specialist financial programmes, for example. Chris Reed, managing director at TRAX, an MRO ERP software solution supplier, explains: "The reason for this is that financial information is sensitive, and most MRO businesses do not like to send it outside of the company. Although the M&E software can obtain all the actual hours booked and materials used for billing, this information is often adjusted independently to compare with that initially quoted before the information is shared." While this sounds unusual, information obtained from the hangar floor in man-hours, for example, often has to be corrected due to misbookings or materials for returns capturing.

To add to this, connectivity to M&E modules for backshops is often not incorporated to the extent of other MRO departments. "Most airline/MROs outsource component overhaul and repair to specialist shops, because they are cheaper and have the greater capabilities and flexibility. There is therefore less focus in M&E systems in this area. This comes back to the economics of scale again," explains Reed.

"Of our many clients using Trax, the majority are not taking advantage of its full capabilities," adds Reed. "There is always work involved in making something new succeed, and the business needs to invest resources and time to do that. What can also happen if businesses are not careful is that they replace the old programme without using the full benefits of the new technology, usually because they want the least disruption to operations, and are afraid to push boundaries."

External consultancy

To assist in the integration of new connectivity systems and software into existing ERP infrastructure, project management can be obtained independently from the M&E system suppliers. Jeff Legg, director of Peral Consulting Ltd, which specialises in ERP implementation projects, explains: "Companies have to be bold to redesign their procedures and systems. It is common for example that the same company can have six different systems spanning six different countries. While they all produce the same product, they do not work the same way. To obtain benefits from the new ERP system, a template then needs to be developed on how the system should work. Templates are a common configuration way of working or set of processes which will be adopted and used by all sites using the new ERP system, replacing the original six different ones in this case. It simplifies training, shortens implementation times and provides for economies by using a single set of data."

"If external consultants are engaged they should be experienced at documenting the expected business deliverables," continues Legg. "An independent project manager acting for

the customer can bring specialist skills to bear which will improve the overall project performance. Today there are more methods for accessing ERP systems and connecting them to specialist applications than ever before. The key consideration is network capacity. We now have the 'CLOUD', 'Hosted' and 'On-site' delivery methods. The ERP infrastructure can be connected via 'Scripts', batch interfaces application program interface (API), electronic data interchange (EDI), database calls, and good old fashioned duplicate keying!"

Integration & data harmonisation

Every time information is transferred between different standards of software, interrogation of the information is required, putting strain on the servers or host systems. For example, when an engineer creates a query via a demand for materials, the preset structure query language (SQL) enquiry will communicate between the servers multiplied by the number of staff interrogating system.

SQL is a special-purpose programming language designed for managing data, and is used to create connectivity to draw information

between databases. The more company systems and information within documents are harmonised, the less costly integration programming is required. Mandatory fields, for example, within documents like ATA codes or zones, may conflict with granulated data on the other document.

To streamline communications between standards, M&E software specialist Swiss Aviation Software (Swiss-AS), the provider of AMOS, a comprehensive fully integrated MRO software solution, has created adaptive integration manager (AIM).

AIM succeeds due to the open architecture of AMOS. The interfacing technology can easily be adapted to the application with which AMOS is interfacing by using extensible stylesheet language transformations (XSLT). XSLT is a language developed for transforming XML information in files into other XML documents or converted into other formats all together.

The architecture allows the customer to either translate the input/output XML files themselves, to outsource this activity to a third-party provider, or to transfer the task to AMOS. Ronald Schaeuffele, chief executive officer at Swiss-AS, explains: "Before AIM there were five or six ways to import and export data for



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the exchanging of electronic information. This requires a huge investment in time for the programmers. AIM assists the customer to bring exported files across in exactly the format the receiving applications need. The layout is now generic and there is only a single point of contact. The customer can manipulate the information defined via its own programmes to suit its needs. In short, programmes only have to be written once, but can run endlessly.”

Harmonisation is a key strategy of the ATA e-Business Program to achieve its vision to “strategically evolve standards to enable the seamless exchange and availability of information throughout the aviation industry,” explains Ballance. “As a first step to achieving this objective, the ATA e-Business Program has launched a new data harmonisation working group (DHWG) to develop and maintain a process for harmonising data across the suite of ATA e-Business Program standards. This includes resolution of conflicting data objects and working towards a standard interface model to reduce data transformation requirements.”

Connected while mobile

The MRO environment, although now filling with more advanced and intelligent aircraft, still has nuts, bolts, fuels, hydraulic fluids and tooling that the latest technology has to co-exist with. Literally the mobile devices will be working with hammers and pneumatic tools. It is an unforgiving environment.

To complement the advancing M&E IT systems available, more efficient maintenance processes, with instant access to technical documents through

voice, touch screen or mobile device while on the shop floor, are now being developed. This is becoming more viable as mobile devices with greater display, speed and processing capabilities, alongside falling hardware and communication costs make the project attractive to MROs.

Users need to have the skills and confidence to use any device, and navigate round zones and ATA chapters. Physical limitations such as the tough working environment, ease of connectivity and understanding of the use of the devices can easily hinder mobile interaction with the host M&E. Schaeuffele adds: “You do not want to push too much IT onto the shop floor. You need to let it be engineer-driven.”

Latest handheld mobile apps

With the demand of reduced check times and increased billing accuracy, mobile handheld screens with one- or two-way connectivity to the host M&E system is becoming more widely supported by M&E software suppliers.

There is a choice of different specialist equipment in terms of apps available from current M&E and CMS providers for mobile connectivity applications. Real-time data capture from the floor, electronic sign-off, and on-the-spot interactive access for customers on findings anywhere in the world, are all available features.

The AMOSmobile App is one of the latest App releases for mobile connectivity for the MRO environment. “On 12th and 13th of November 2015 the software will be displayed to an audience of 150 people, including representatives from 80 of our customers

The constant drive for improved labour efficiency has led to ‘eyes-free’ product developments to go along with the ‘hands-free’ inspection processes through the use of voice recognising software.

worldwide at an AMOS users conference in Switzerland,” says Schaeuffele.

“The product’s proof of concept phase has been completed, with greater field tests now planned to further test the programming cycle,” adds Schaeuffele. “The AMOSmobile App consists of a touch-optimised mobile package for the AMOS community that will compile a range of modules for use on mobile devices. The first module targeted will be ‘maintenance execution’, which is aimed at production staff that do not have a permanent work station yet still need to interact with AMOS to perform their daily duties. AMOSmobile will allow its users to record transactions remotely, access manuals, and interact with OEM and customer-supplied information stored onto AMOS.”

The application is fully integrated into AMOS and can run on any handheld device, such as a tablet or smartphone, and uses state-of-the-art web-application Vaadin technology while running through a modern web browser supporting HTML5 on a mobile device. 3G, 4G or WiFi connectivity is all that is required.

Vaadin technology allows single-page web apps to be built. These reside on the server, and are accessed by the end user via a HTML5 web app on their browser. It also uses a graphical user interface (GUI), which allows users to interact with electronic devices through graphical icons and visual indicators, rather than text-based interfaces, typed command labels or text.

Schaeuffele notes. “The screen has dashboard capabilities which are designed to show important and relevant information only (see picture, page 82). Mobile options like Smart phones and watches will work for acknowledgments and approvals along with start-stop functions. The visual format, however, will be best used on tablets for user interaction.”

AMOSmobile is one of the many advances that Swiss-AS has made in developing IT solutions for airlines and MROs. For release next year to complement the AMOSmobile App, the new MRO Edition of AMOS will be available to supplement the current continuing airworthiness management organisation (CAMO), airline, and airline-MRO editions. Key features will cover areas such as customer relationship management, quotation and contract



Used at the APU shop in Lufthansa Technik, Vocollect has freed technicians from the time-consuming task of writing and maintaining documentation during the inspection process.

management, facility and hangar planning, along with financial project analysis. More information will be provided on this as it develops.

Wearables

Since many manufacturers of wearable systems also produce handheld devices, such as smart phones and tablets, the processes required to interface wearable and other mobile devices with M&E systems is generally similar. This is allowing the growing ability to use wearable technology on the hangar floor, workshops and within the warehouse environment.

'Eyes Free' solutions

Wearables offer on-the-spot IT support for users allowing multiple tasks to be performed simultaneously, thereby increasing labour efficiency. At the forefront of the 'hands free' and 'eyes free' wearable technology is Vocollect Voice Solutions, developed by global technology manufacturer Honeywell through its automation and controls solutions (ACS) division.

While most mobile handheld devices, such as electronic note books, still require the inspection process to be a separate function to documentation completion, Vocollect takes the drive for greater labour efficiency even further by actually interacting with the user via the spoken word. Any verbal response from the user in return is then captured via speech-recognition software, and then converting it to text. This text is then communicated

back to the host M&E system, providing 'real-time' inspection progress and on-the-spot task certification. In an MRO environment, for example, this could be relaying the inspection instructions of a work card, and then the mechanic's completion of each step, including the reporting of any findings.

John Bradshaw, business development manager at Honeywell Sensing & Productivity Solutions, explains: "For MROs, it is not just about selling the product, but selling the solution. Our voice solutions help businesses increase worker productivity by up to 35%, while reducing errors by up to 25%. Supplied software, configured with the required instructions set for the user's specific requirements, is sent over a wireless network to a voice-enabled mobile computing device that can be worn on a belt, or kept near the workstation. Through a Bluetooth signal, the instructions are then converted to speech and sent to the wireless headset worn by the technician undertaking the task. If needed, the technician can then prompt the software for additional visual information and consult a display, which is also kept close by to review any images or descriptions."

The Honeywell Vocollect solution has been developed over 20 years and primarily been used in warehouse distribution centres. It has recently been adapted for use within the aerospace industry. The Vocollect creators have recognised that the technology needs to work effectively in the widest range of facilities, and with the widest range of employees. The computer-based speech

recognition software learns the user's voice patterns for improved quality of interpretation, by taking into account the language spoken, accent detected and unique pronunciation used. Through strategically-mounted microphones, external noise is also interpreted to be correctly filtered out so as to not affect voice recognition.

Trials have been undertaken in MROs, including Lufthansa Technik's aircraft maintenance facility in Hamburg. With a 20-hour battery life the device can easily handle a normal 8-12-hour shift.

The Honeywell Vocollect Voice Solution for maintenance and inspection has brought benefits on multiple fronts. These range from clear compliance with required maintenance and inspection standards to increased productivity and reduced risk of errors. "A key advantage of Vocollect voice technology has been that it has freed our technicians from the time-consuming and burdensome task of writing and maintaining the required documentation," states Ole Gosau, APU shop manager at Lufthansa Technik. "Previously that was taking up about 50% of their working day."

"Using Vocollect voice technology has made the process really smooth," adds Robert Garbas, one of the five mechanics in Ole Gosau's team with extensive experience of disassembling and assembling APUs. "When performing the incoming inspection, we can now work with our hands and eyes free of distractions, and concentrate on the specific task in hand."

"From the start to finish of the project the solution has delivered," concludes Ole Gosau. "Service quality, compliance with standards, productivity, working conditions and employee satisfaction have all increased substantially through using Vocollect voice." The next step involves integrating Vocollect with the company's SAP system. Ole Gosau then sees scope for applying the system to additional APU maintenance processes and then, potentially, to servicing large turbines.

Bradshaw adds: "Customers using Vocollect have saved more the \$20 billion annually. The costs associated with its implementation are easily pulled back

within a year of operation, due to error prevention and productivity increases. Honeywell is also in talks with OEMs, such as Boeing and Airbus, to establish a subscription-based collaboration to supply information in a format usable for Vocollect. This will allow digital information to be readily transferable between a chosen CMS or M&E system.”

Connectivity difficulties

Apart from the aforementioned integration issues, further difficulties in connectivity can be as straightforward as signal loss, especially when working inside the aircraft. Frustrations for staff will occur when information takes time to load due to document sizes transmitted or latency issues between the Web/Cloud provider and the MRO IT systems.

Further restrictions can come from the resistance to breaking from traditions. In a heavily regulated industry, dirty fingerprints are still the general acceptance for proof of task completion. It will take time to break this pattern completely and it is not generally as a result of each region's airworthiness authorities, but more a process of letting go what has worked for so many years.

“MRO IT systems generally are not specifically approved by the airworthiness authorities worldwide,” explains

Godwin. “Systems such as OASES are viewed as tools which facilitate work and process flows in line with strict aviation regulations. Such systems can be used in their entirety, or in conjunction with paper systems or other IT processes. The regulatory authorities approve the airline's or MRO's overall processes, including its people, in the use of its various systems in demonstrating compliance with regulations. This forms part of their exposition and approvals.”

A further point of note of emerging difficulties with current connectivity evolutions is the physical amount of information being generated by the latest aircraft, and then the physical interpretation of it.

“For example the 787 is a software-driven aircraft,” says Reed. “Components like fuel pumps now contain numerous sensors for component operation and monitoring. The data for this increasing quantity of software on the components all require additional revisions to maintenance programmes to monitor. Even when thinking of the information obtained during flight, a few years ago aircraft were generating only a few MB per flight of information. Today the 787 generates up to 500GB (half a terabyte) per flight. The increasing volume of generated data needs processing in a useful way to be accessible. Although this

kind of information requires greater information storage capabilities, it can turn the MRO industry into a predictive maintenance environment rather than a reactive one.”

Summary

The cost of connectivity systems within an MRO can be controlled by the type of infrastructure chosen to work with the host systems, along with a full analysis of the level of implementation required. The key, however, is to have the knowledge and tools to make the most of the software advances while not hindering the day-to-day work requirements.

The MRO sector of the aviation industry has in the past been considered rudimentary and antiquated compared to others. A reluctance to leave behind the dirty fingerprints method plays a part in this. But as the airlines and lessors require real-time information and data feed into their choice of IT software, to achieve seamless information transfer and greater production efficiencies, MROs are having to embrace new technology that increased connectivity has given them. [AC](#)

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