

Dashboards provide a concise and visually effective means to display data on a daily basis. In an MRO environment, the ability to condense and update the status and progress of thousands of routine and non-routine task cards can realise significant efficiencies for maintenance providers. Key characteristics of various maintenance dashboards are outlined here.

# Maintenance production management dashboards

**A**ircraft Commerce has extensively explored big data, electronic and paperless processes, and data management as part of its maintenance IT coverage. These have proven crucial to maximising efficiencies in a maintenance organisation. How this electronically generated data is presented allows it to be viewed and acted on by large groups of people in airline and maintenance environments. Data in itself is not valuable, unless it provides insight. It is this insight that can lead to better processes in an organisation.

The availability and presentation of such information can influence the operational processes, decisions and direction of a time-pressured business such as a maintenance, repair and overhaul (MRO) provider. Dashboards are a simple solution to presenting key pieces of operational data. “Dashboards are a useful tool for system users at all levels in aircraft maintenance,” says Ian Kent, aviation consultant at Rusada. “In maintenance production, these users include senior managers, shift managers and supervisors, maintenance controllers, maintenance planners, production planners, and engineers/mechanics from the line and base maintenance, and maintenance control business functions.

“It is also useful if operational staff have access so that they can monitor the status of maintenance work in progress to identify any potential issues with operational availability,” adds Kent.

A dashboard presents data in a time-efficient and user-friendly way, using portable electronic devices (PEDs), digital processes and an integrated maintenance and engineering (M&E) IT system. According to Dr Hugh Revie, vice president regional sales (EMEA) at Empowermx, dashboards are typically a point of reference in offices (such as

maintenance control and logistics), as well as the hangar floor. The two main types of MRO dashboard relate to line and base maintenance activities.

A maintenance management production dashboard typically illustrates the overall health of the aircraft, or manpower, or processes, in a base maintenance hangar. “The dashboard should accurately show for each aircraft assigned/unassigned work, open/unopened tasks, inspection phase status, skillset requirements, materials, and tooling information,” explains Chris Reed, managing director at Trax.

Additional information can be included, depending on the MRO provider, so the dashboard can give a clear overview of its performance per occupied bay, and show how ‘on target’ the business is at any given moment in time. Before digitisation, dashboards were no more than large whiteboards with handwritten or printed sheets that were manually updated on the hangar floor. This caused delays in crucial reporting, but remains a common method today, since most MRO providers are still not yet fully electronic. This inherently inefficient method leads to discrepancies in performance reporting, and ultimately causes delays in the completion of checks.

Electronic dashboards, which display information fed from newly electronic processes, facilitate the shift from whiteboard to a computer screen or TV monitor and can become more dynamic through system integration with M&E software. For example, they can update automatically, showing more detailed or current information, becoming easily customisable and ultimately more reliable as a tool for promoting efficiency.

Dashboards do not revolutionise the processing of maintenance data. They are merely an effective way to display data that is now available from revolutionary

or ‘disruptive’ new processes, such as: the use of PEDs in line and base maintenance, digital and interactive task cards, and electronic signatures and work orders. The functionality of an electronic task card, which is how much information can be digitally rendered and used, optimises what an electronic maintenance production dashboard can do.

Dashboards present important information concisely, using traffic light systems (meaning red, amber and green status highlighting whether a check or task is on target) and graphical illustrations, for example. This allows time-critical information to be presented in the best way to alert key decision makers within the MRO provider. The use of graphs, for example, can compare current maintenance activity to historical data for the shop. What each user of the dashboard sees will depend on their individual role and responsibilities at the line station, or base maintenance hangar.

A line maintenance or maintenance production management dashboard therefore makes data visible, speeds up access to crucial data, and ultimately promotes man-hour (MH) efficiency. Reed says that customers using Trax’s eMRO suite of applications can achieve a return on investment (ROI) in paper savings within three months of going digital. This is without considering the wider efficiencies gained by the business, which will be explored here.

Quick access to real-time dashboard data is also time-efficient. “The ultimate goal of an MRO provider is to achieve predictability in aircraft maintenance,” says Menno Ouweneel, product manager at MROair. By optimising dashboard data with the MRO provider’s historical performance, and integrating with its M&E system, MROair aims to provide real-time maintenance dashboards that



consistently monitor the health and status of an MRO provider's maintenance activities.

Dashboards are customised to each MRO provider's requirements. That is, does it perform in-house and/or third-party work? Does it carry out heavy or light maintenance?

"Information requirements vary by operator, but typically managers want an overview of the status of maintenance execution against the plan, and details of any problems that may risk the planned completion of maintenance," continues Kent. "They also want details of any maintenance that will be deferred and critically any operational limitations that the aircraft may have post-maintenance. Cost information, such as actual MH and material costs against budget, can be critical, especially for third-party MRO providers."

Requirements also vary between types of maintenance-oriented dashboard, such as line/hangar maintenance, parts stores and waste management. "Line maintenance and base (hangar) maintenance typically have different priorities," says Kent. "Areas of focus for maintenance execution and oversight and the associated timescales involved are normally very different. Maintenance control typically wants an overview of fleet and individual aircraft serviceability, as well as of the status of maintenance work in progress. This is normally biased towards operational line maintenance, but they can also have an interest in base maintenance activities."

A line maintenance dashboard will be geared toward ensuring that aircraft turnaround times (TATs) are being met for the airline. TATs can vary from 30

minutes to a few hours, depending on the operation. Line maintenance is therefore time-critical in a completely different way to the pressures of a base maintenance environment. Defects will need to be highlighted per aircraft and gate number, and prioritised depending on the category of the defect observed, for example whether: it is a minimum equipment list (MEL) item; a go or no-go item; or if rectification can be delayed until the aircraft is in heavy maintenance or after a number of cycles. The line mechanic needs enough information from the dashboard to act immediately on the data, whether it is to request parts or a specialist engineer, or release the aircraft to the crew for operation.

If the dashboard is accessed on a PED, the information it presents may vary according to whether the user is a mechanic, account manager or maintenance planner. "The need for users to access information relevant to their job extends across the entire maintenance organisation, but the type of information needed differs by role," says Mark Martin, director, operator edition product line at IFS. Its M&E solution, Maintenix, uses different methods to present information to users, including dashboards that are optimised for different form factors or devices in use. "The information presented is tailored to the work that needs to be carried out. Supervisors and planners, for example, are often at desks so we use large format dashboards with filters, so that only relevant information is presented. For more mobile roles, the dashboards are single-user, optimised for a tablet, and show information relevant to that user and his tasks and priorities."

*The use of dashboards for activities such as base and maintenance and hangar checks is reducing check downtime and improving labour efficiency in the order of 10%.*

Martin adds that simply displaying basic data, is not enough. "Data must be presented in a way that has meaning to the user," he says. "Having context is what turns raw data into something the user can act on. Since people performing different roles have different concerns and priorities, they need different information. For example, Maintenix supports multi-horizon planning. The concerns of a station planner working on today's plan differ from those of a planner working on the long-range maintenance plan for a full fleet."

This article will focus mainly on maintenance production management dashboards in a base hangar environment, because that is where the heaviest work takes place and so individual mechanic efficiency is crucial. Base maintenance is more time-sensitive than line stations, or parts stores. Its tasks are complex, and require diversity in skill sets, so the MRO provider's experience in people management is essential. Managed efficiently, heavy maintenance checks can streamline costs and aircraft downtime to a notable extent for customers, which can therefore retain and boost contracts.

This feature will look at several dashboards provided, and summarise the most common and useful dashboard characteristics required of MRO shops.

## Trax & eMRO

Trax software works on iOS-based PEDs, such as the iPad, via its eMRO suite of applications (apps). The eMobility app has dashboards for line maintenance, production control and shop control. The Line Maintenance app in eMobility monitors the progress of line mechanics situated at a line station. Production Control shows the status of heavy checks in a base maintenance hangar, while Shop Control monitors component status in the MRO provider's part stores.

The Production Control dashboard, in the eMobility application, can update in real time, depending on how digital the MRO's update processes are. The more digital they are, the more automated the distribution of information becomes within the suite of applications. "The height of this digitisation currently ends with the use of an electronic task card,



which can break down the steps within a single task,” says Reed. “Dashboard updates need to be flexible enough to accommodate i) paper processes, ii) hybrid PDF / early digital operations, and iii) electronic processes. Customers using paper task cards are likely still to be using a whiteboard to show the progress of work orders and base checks.”

The Production Control dashboard in eMobility bridges the gap between paper task cards and digital output to effectively manage data. Trax sees its customers making the move to now using the dashboard in the software suite on a PED. This is in line with basic mechanic-oriented functions now moving to the PED, such as log-on/off functions on an electronic taskcard. PDF taskcards, scanned to eMRO, can have the header swiped to signify job start/finish, so that hybrid and fully electronic processes are accommodated. The eMRO system can monitor each separate step in a task to effectively assess the progress if an electronic taskcard is used. A mechanic can also start individual steps, increasing the accuracy of the task status on the Production Control dashboard. If an inspection step arises as part of the task, the mechanic can summon an inspector via a ‘live’ request that will send a notification to the inspector’s PED. All this information can be seen on the dashboard to show visibility of task progress, and improve communication between multiple departments, roles and skillsets. Reed advises that the Production Control dashboard, showing each hangar bay’s check-health, is generally presented on large monitor screens in the hangar.

Dashboards can be manually split to monitor skill, or phases of check within Trax’s eMobility application. Management can also allocate non-routine (NR) tasks to an available and qualified mechanic. Each mechanic’s PED receives real-time notifications with a list of appropriate task cards/work orders per aircraft. If management error has sent a task to a mechanic who believes he does not have the appropriate level of experience (such as a recently qualified

mechanic being sent a very complex task), then the mechanic can send a request to a planning engineer to re-assign the task accordingly. The progress of these tasks feeds into the Production Control dashboard with every task update the mechanic provides via his electronic/PDF taskcard.

“If our customer is still using a paper system, they can also take advantage of Production Control,” explains Reed. “The customer will execute paper processes but manage them electronically, although this will affect their ability to glean insight from real-time data, and prevent them from gaining the same level of efficiency savings.”

All of Trax’s customer base are building checks electronically, but 98% are still printing taskcards. Mechanics therefore take the paper card, go to a workstation, log on to Trax and start/sign off tasks via its software on the terminal. “Furthermore, using paper cards will not allow the granularity offered by electronic documents,” adds Reed. “The MRO provider is unable to determine the status of individual task steps, and general minute-by-minute progress in the hangar. The dashboard will therefore just show work order statuses in this scenario. The importance of real-time and extensively detailed dashboard information will increase in line with the scale and activity of the MRO provider.”

Achievable e-task cards are gradually moving into PEDs. Connectivity has been an issue for MROs assessing the suitability of electronic processes. For example, the empennage of an aircraft is commonly a blackspot for cellular and wireless internet. According to Reed, however, mechanics using the Trax applications can still update task progress via their scanned PDF or e-task card even if connectivity is lost; the system will simply update the dashboard as soon as connectivity to the PED is re-established. “Applications cannot be purely online,” he explains. “Online or cloud-based applications are limited in the event of loss of connection, since access to the task card and other data can fail.

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Online/offline capability is therefore very important.”

Via Trax’s Production Control, users can click on each occupied hangar bay to see a range of progress-related data, monitored against MRO-set parameters. This can include open routine task cards versus open NR tasks; actual applied MH against planned MH; and number of tasks completed compared to the day before. Routine and NR tasks can be viewed to show how much of a task remains to be completed, the mechanic performing the task, and whether an N-R has been assigned to a mechanic.

Such information allows planners and maintenance control to allocate the shop floor workforce effectively. Trax’s traffic-light system on each dashboard provides further visual representation of a task’s progress. If it is red, then progress has slowed beyond the MRO provider’s expectation, and the task will be prioritised. N-Rs are also prioritised in terms of severity. Task status can also be viewed according to skill set, whether engine, avionics or airframe, to determine where more attention is needed.

Reed explains that the move of the dashboard from whiteboard to TV monitor has changed the hangar environment for Trax’s electronic users. “It is now easy to see if a mechanic is encountering issues or falling behind with a task, so it encourages others on the shop floor to assist where needed,” he says. Reed adds that a customer using its eMRO suite of applications, via PEDs, has increased MH efficiency by 9% since it incorporated the Production Control dashboard into its hangar. Put into perspective, if an MRO is completing 60,000 task cards a year, it is gaining the ability to complete a further 5,400 task cards using the same workforce. “It has allowed the same manpower to achieve a greater number of tasks, because tracking progress correctly and saving walk-time to update a workstation has allowed overall task completion time to be reduced,” adds Reed. Visible digital dashboards have promoted a team effort in the base maintenance environment.

According to Reed, this use of high-visibility electronic dashboards has also allowed proactive initiatives to flourish, such as an automatic reservation system for routine task cards in a new check. An optimiser routine sorts and attributes

*The use of an electronic maintenance dashboard such as those present in IFS Maintenix increases efficiency across many areas in MRO, including cost management, labour, mechanics per task, and shop visit turnaround time (TAT).*

cards according to the experience of each mechanic on shift. Checks can be automatically reorganised within five minutes if a mechanic goes sick, for example, or if a taskcard must suddenly be prioritised due to complexity or emerging N-R requirements. This enables MROs to meet the targets set for the day, which is crucial to evaluating efficiency.

In addition to the line maintenance and shop control dashboards within eMobility, other reports include shift handover reports, milestone reports and a summary of unassigned personnel. Each of these further aids the digitalisation of an MRO provider's core efficiency.

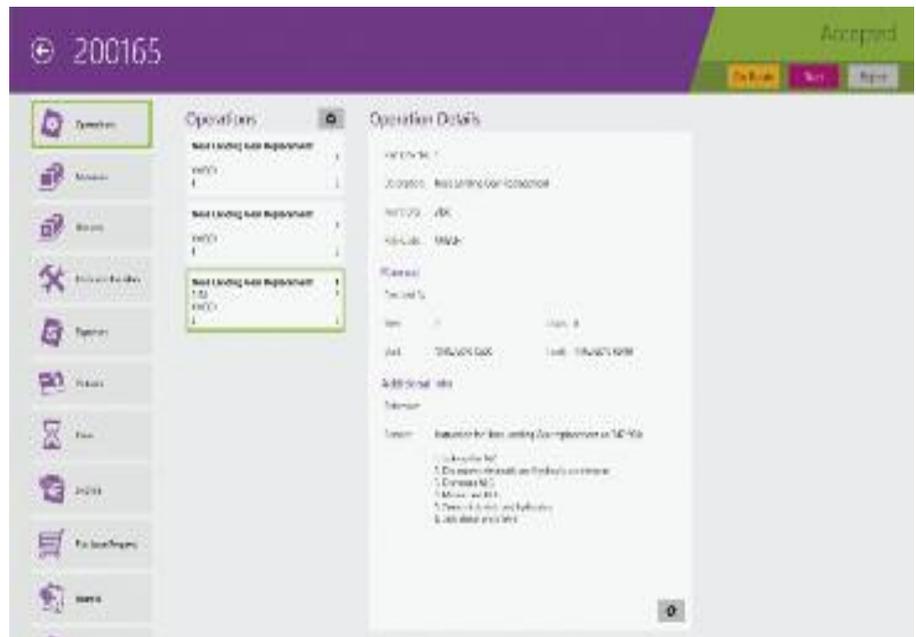
## Rusada & Envision

Rusada provides dashboards focused on work order, hangar and capacity management within Envisions Base Management suite of modules.

"Envision dashboards are highly configurable to meet individual customer requirements, and can take data feeds from a number of data sources," says Kent. "In the area of maintenance production, these typically include work order/task statuses, material/tooling /service requisitions, and defects. Shop floor data-capture information includes the status of work orders and tasks including MH booked and estimated time remaining. Our dashboards are made up of individual components that can be created with relative ease providing the source data is being captured. These dashboards can be customised by users."

Envision's dashboard data can be set to automatically refresh at a given frequency, or it can be driven by changes in the status of a data record depending on how digital the customer is. For example, whether they are using digital task cards, or electronic signature.

Kent adds that the principal benefit of dashboards is that they can provide instant access to information that users need to support good decision-making. "A good dashboard will not swamp users with irrelevant information and will focus on showing what requires action, such as a material requisition for a part that has an estimated delivery date beyond the planned completion date of the maintenance," he continues. "In this case, presenting this data on a dashboard at



the earliest opportunity allows a user to spot the potential problem and take action before it becomes a real issue."

Kent also explains that irrespective of the task card format used by a customer (and often it can be a mix of formats), Envision has an electronic version of the work order and work order tasks. The status of maintenance execution is driven from these electronic tasks, so the dashboard information can remain dynamic, providing the customer is processing data in real time.

"Providing the data required to support the key performance indicator (KPI) is being captured, any number of KPIs can be measured and presented," says Kent. "In dashboard formats, these tend to be visually displayed rather than as a structured management report that is available through standard report functions. Rusada is developing data analytical tools that can be embedded in the dashboard to allow users to drill down into high-level KPI information to further support the decision-making process for MRO management."

On the subject of data analytics, dashboards might change, in format, use and capability, as the use of big data becomes both more widespread, and better understood by the aviation industry. "Big data is an interesting and topical subject, but it is something that is not fully understood in the aircraft engineering and MRO world," adds Kent. "Much of the current focus is on the wealth of additional data that is being generated by the modern generation of aircraft systems and components that will support better operational analysis and predictive maintenance, but that does not have a direct impact on maintenance production. The level of information captured in this area has changed little over the years and we do not anticipate this changing significantly in the future.

Better tools and techniques are needed to support data analytics and the development of dashboards is a good example." In effect, the dashboard provides a concise and useful means to present key health-related data. Health indicators, such as whether the MRO is meeting its check targets, will not change. The accuracy of the information regarding the aircraft's overall health, however, will benefit from a greater understanding of big data. "As organisations move towards optimised and automated processes, the amount of transactional data captured will grow," explains Kent. "An example of where this might allow better data analytics would be the review of tooling movements, which has traditionally been a difficult process for organisations to understand." This would have the potential to affect task status, and therefore the information provided on a dashboard.

"By automating the process that tracks the movement of tools between stores, engineers, aircraft and tasks, it will be easier to analyse and optimise it, therefore allowing efficiencies to be made," continues Kent. "By capturing more data during the transactional processes, problems can be identified on a dashboard, enabling supervisors and managers to take appropriate actions."

In addition, moving away from traditional paper-based task cards to e-task cards facilitates the breakdown, and therefore the management, of tasks at sub-task level. This means that associated information such as work allocation, execution, material issues and defects arising can also be broken down to a more granular level, enabling more detailed analysis of maintenance operations. "Data captured in all areas of aircraft engineering and maintenance operations could always be used more efficiently," says Kent. "Traditionally



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maintenance organisations have been better at data analysis of logistics and the supply chain than of maintenance operations, and an increase in the amount of data being captured will not by itself improve matters. Organisations need to get better at this, but the development of good tools and techniques such as data dashboards will certainly help.”

## IFS & Maintainix

Maintenix is an end-to-end electronic system. Martin says that electronic M&E systems, with electronic taskcards and sign-offs, provide the only real-time capable dashboard. “With paper task cards there is a delay, and the potential for missed or incorrect updates,” says Martin. “Similarly, with scanned cards, there is a lag between them being signed off and scanned into the system, and the potential for incorrect data extraction.

“When we visit some organisations we still see handwritten information on a whiteboard,” continues Martin. “It raises so many questions. Has it been updated? By whom and when? Is it even legible? The difference in quality between the whiteboard and real-time electronic information is enormous.

“Our dashboards primarily display information from the Maintainix system, which tracks execution in real time,” adds Martin. “We can display progress against tasks, because they are marked as completed by users. Information from other systems can be accommodated as well, such as expected landing time/gate information from the flight-following system, labour availability and so on.”

Real-time dashboards allow management to keep a finger on the pulse of the most critical performance indicators including TAT, determined through dynamic critical path analysis,

workforce efficiency, and continuous improvement trends.

The information displayed by the Maintainix dashboards depends on the context. “For ‘day of’ use by station planners, they want to see if they have labour, parts and tools ready to meet their obligations,” says Martin. “Anything that puts their plan at risk needs to be highlighted. For example, if an expected part has not been delivered, this needs to be addressed quickly. IFS’s Maintainix dashboard shows this sort of issue as a priority item, using alerting and visual cues/iconography so that the planner knows there is a risk item to be solved. ‘Business as usual’ items become clutter, and can be filtered out.”

According to Martin, dashboards, especially those with mobile interfaces, extensively use settings, preferences and filtering to present information as the user wants to see it. Similarly, the Maintainix planning dashboards allow planners to filter to their fleet, or their station to show the data they need and in the way that they need it. “Other dashboards can be customised by the customer, but usually involve IT to connect and/or configure per the user requirements,” adds Martin.

The use of an electronic maintenance dashboard increases efficiency across many areas in MRO, including cost management, labour, mechanics per task, and shop-visit TAT. “On the execution front, the mechanic has what they need on the mobile device or PED, so there is no need to go back to check or update the board,” explains Martin. “They can update task status right at the aircraft. Others immediately see the update, which makes releases, deferrals and turns faster.

“We also see tremendous value for station planners receiving real-time status updates,” continues Martin. “At a glance,

they see where they need to focus their attention. They can redirect resources and take advantage of opportunities for maintenance, using ground time more efficiently, and ensuring there are aircraft available to meet obligations to the flight schedule. Meanwhile, in the hangar we have seen cases where TATs have been halved once shop floor performance was visible in real time across the enterprise. Any slack and/or bottle necks in the process are rapidly apparent, and can be measured, addressed and monitored to ensure improvements and best practice.”

IFS advises that the benefits of a maintenance production management dashboard are maximised if the MRO provider overlays actual in-work progress over planned progress. A key way to indicate the MRO provider’s performance is by using historical data to provide the most realistic prediction of how long a check should last, thereby enhancing the accuracy of the planned progress predictions. This can realise significant customer service benefits for the MRO provider. By making the estimates of aircraft downtime as accurate as possible, the MRO provider is maximising its reliability in the eyes of its customer. This, arguably even more than cost, is of utmost importance to an airline scheduling aircraft maintenance together with busy flight schedules. “With respect to data extracted from a dashboard, the focus is on identifying, and proactively reacting to, exceptions or risks to a plan,” says Martin. “This includes, for example, how many NRs are raised throughout inspection phases, and how they compare to the expected effort based on past best practice templates and experiential data.”

Once again, the extent to which a customer can realise the benefits of an M&E-generated dashboard is directly proportional to how digital its operations are. It is therefore a further consideration to those building business cases based on becoming electronic or paperless, and ultimately disrupting legacy processes.

Maintenix uses an electronic paradigm, and IFS has customers at various stages in the journey to paperless processes. “We have customers like Qantas that are completely paperless and have been using e-signatures for years. Meanwhile, others such as LATAM are electronic, but not yet using e-



signatures,” Martin explains. “These customers are heavy users of dashboards in the Line Execution and Line Planning areas, and are making progress towards maximising the potential of base maintenance dashboards.”

The next step for those applying day-to-day electronic processes in operations, is to look at increasing the sophistication of the data used. As discussed, one key concept is the use of Big Data Analytics to enhance overall performance and efficiency. “We see huge potential in being able to extract information from a wealth of maintenance data about your fleet that sits inside the M&E system that forms the hub of electronic activity,” says Martin. “Much of the data is dark. It just sits there inactive. Its value comes from being able to extract key information and apply the insight it gives you to other uses, such as comparing your component reliability against industry peers.”

In turn, how could the maintenance data that is presented on the electronic dashboards be used more efficiently? Martin explains that one trend gaining momentum is the ‘digital twin’, a digital replica of complex assets. “We see great promise in applying data including some from the M&E system, to the digital twin to predict what will happen, to head off problems before they can occur, to prevent downtime and even plan for future maintenance requirements by using simulations based on real data,” he says. “As the amount of information collected in the real asset and fed to the digital twin increases over time, the simulations, and the predictions, become more accurate. We see many uses for the output from these digital twins in decision-making dashboards, comparing actual to projected, and raising alerts for special checks based on environmental or other issues.”

## MROair & Line maintenance

MROair is an add-on software, designed to extend the capabilities of current M&E systems. It offers three main dashboard formats as part of its solution: Line Maintenance and Waste dashboards are live; while its Base Maintenance dashboard is shortly due for release. “The solution of MROair is built from the ground up together with engineers, because they were asked what they need to perform their tasks more efficiently,” explains Ouweneel. “This allows us to offer an app with a high employee satisfaction rate. MROair’s solution collects data as it is used automatically and will produce tactical information like: work order progress; and who is working on what and where. We collect data that will show waste and inefficiencies within the processes that will help to optimise business processes. This means doing more work with fewer people, or operating more aircraft with the same number of people.”

According to Ouweneel, MROair provides a digital solution for current processes to visualise the results for key positions in an MRO. The software vendor has created multiple dashboards for all levels in management. Its Line Maintenance dashboard shows which line mechanic is performing which task, and at which gate. By monitoring the progress of the job, and measuring in real time the ground time available for the aircraft at that gate, an accurate overview of the team working on each aircraft in operation can be established.

Its Base Maintenance dashboard is in development, and will show all aircraft in the MRO’s own hangar, and can be filtered/separated by aircraft-per-bay. The Base Maintenance dashboard is due to go live in April, though MROair is looking

*MROair is an add-on that provides base, line maintenance and waste management dashboards. Its line maintenance dashboard is currently being trialled by SR Technics, while its base maintenance provision is due to go live in April 2018.*

to advance this through customer trials. “This dashboard is designed to show progression, the mechanics and engineers at work, and the findings and on-holds of the active work orders,” Ouweneel says.

Last, MROair’s Waste Dashboard shows the overall waste in transport, motion, waiting, skills and over-production for the MRO, thereby highlighting areas of inefficiency within supply chain management. “To establish operational efficiency you need real-time information on waste so that you can proactively avoid wasteful events,” adds Ouweneel. “In addition, one needs a clear view on three variables: the aircraft; the engineer; and the work orders. For the line maintenance environment, a dashboard needs to establish different variables: for the aircraft it has to show real-time information on incoming and outgoing flights, and the exact available ground time (TAT) or hangar throughput times needed; and for the engineer, it has to show access to different skills, certificates and shift change information. Last, the amount of jobs to be performed per work order must be clearly shown, but as this can change at any time due to findings, the dashboard needs to be able to react to updates in real time.”

Ouweneel adds that currently, there is no paperless system like MROair that will visualise these three variables in real time. “We can log a lot of information, even when it is not reported by the engineer,” he adds. “Our solution reports clock times, used materials, used MH, raised N-Rs, waiting time, and performed work order and task cards.”

MROair is designed to be used in conjunction with an enterprise resource planning (ERP) system, so it optimises the information being fed into these M&E systems. The engineers and mechanics will input the information into their in-house or subscription-based system, and MROair will process it via an integration with the software to present it in a way that is specified by the MRO shop. MROair can be used with or without an M&E system. “MROair is built ‘on top of’ existing systems like AMOS, Trax or other ERP software,” explains Ouweneel. “This means we see best how the work orders, task cards, N-Rs, stock and actual work hours are used. We do not record

Line Maintenance dashboards, such as that provided by MROair, generally illustrates which line mechanic is performing what task, and at which gate. Task progress is overlaid against a real-time measurement of the ground time available for the aircraft at that gate.

the work orders as such, but record all the utilised data and how it is handled by the MRO. This is impossible with paper and printed information.”

If a customer uses paper task cards, however, MROair will receive scanned copies of the task cards from the MRO to add to its system and archive digitally. In this case, customers using MROair’s line maintenance dashboard will be able to work out how fast N-R tasks are being actioned/resolved, in-progress work orders, and whether aircraft are leaving on time. If digitally used, the whereabouts of mechanics can also be monitored, thereby illustrating the efficiency of the MRO’s processes and mechanics.

“Via MROair’s dashboard, a single overview shows the status of aircraft, including the progress of work to be performed, who is working on what and where, and what work orders are currently active (including progress, on-hold reason, and raised N-Rs),” adds Ouwenel. He explains that MROair’s current solution works in commonly used browsers such as Chrome or Safari, and is device-independent. “This means we do not dictate the hardware or software to be used to work with our dashboards.”

Ouwenel points out that while dashboards provide insight, that alone does not create efficiency or effectivity for an MRO provider. “Efficiency improves only if action is taken based on the information presented. If nobody takes action, then nothing changes.” By optimising data with intelligence, such as enhancing the information available by comparing it against historical data, and combining Big Data to allow predictive maintenance to form, Ouwenel explains that dashboards can become more intuitive, and help decision-makers become more proactive in meeting targets. MROair’s dashboards can therefore show real-time information on possible aircraft delays, longer-than-usual ground times arising, unused manpower, and used materials (in relation to supply chain management) among others. This next level of dashboard information generates insight to steer the MRO process in tasks, people, means and material. This means that when action is taken, MROair’s dashboards will show the results ‘before’ and ‘after’.



## EmpowerMX & FleetCycle

The FleetCycle software offered by EmpowerMX is an M&E solution that offers MRO providers many customisable reports, in addition to available ad hoc reports that can be developed by the customers themselves. Dashboards are an integral part of FleetCycle, and are used throughout its suite of applications.

FleetCycle’s base maintenance dashboard has a new, mobile software release. “Our dashboards are now app-configured,” says Revie. “While management dashboards, such as those used within a maintenance production environment, used to be purely management focused, they are now becoming increasingly important throughout the business and across a growing number of users. Technicians now benefit from access to maintenance production dashboards, for example. Within an MRO provider, everyone from mechanics to managing directors can view and manage dashboard output.” FleetCycle’s dashboards are picture-driven and configurable on a role basis. This means that the individual’s profile drives the information that person can see, based on unique data for that role.

Revie explains that every department in an MRO has different things to monitor. “While the logistics department needs to establish how quick response times are, maintenance control wants to see whether the shop floor is hitting targets for checks,” he says.

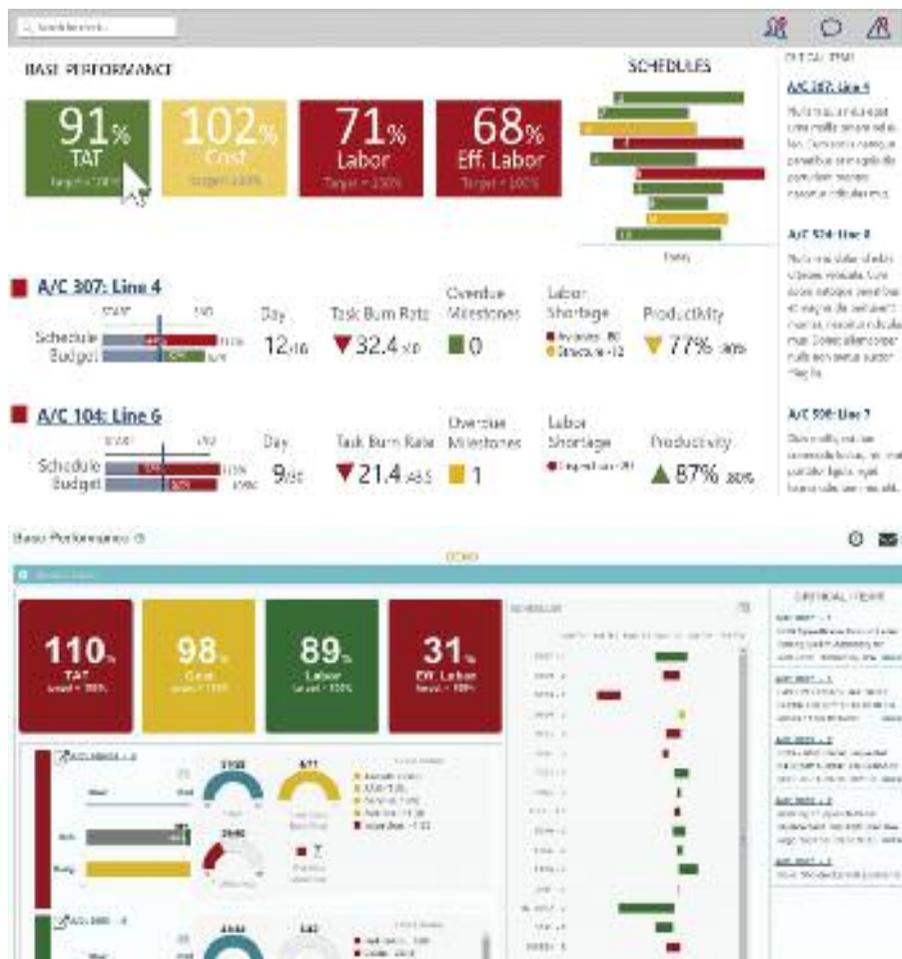
EmpowerMX’s Production Management dashboard is used in heavy maintenance. Revie says that the ‘overall’ view of the Production Management dashboard is displayed by many of its customers via large screens, so that maintenance check status updates are

visible across the hangar floor for mechanics, technicians, engineers and inspectors.

Aside from minute-by-minute updates for those on the hangar floor, the ‘morning review’ is a key area whereby a digital Production Management dashboard can hold significant benefits for airlines, Revie adds. This review is a daily meeting that takes place in an MRO provider to establish whether each aircraft in the hangar is ‘on target’. Key concerns will be discussed by maintenance planners, engineers and shop floor managers, with plans to combat ‘red flags’ and potential issues arising in checks.

A dashboard can therefore present information that prevents time being wasted in establishing what items need to be discussed. Revie provides an example of an MRO provider with 12 hangar bays. A morning meeting could take two hours to review a number of aircraft if there is no electronic dashboard. In this case, discussions need to take place to establish where each aircraft is in its check, and further input is required from each member of the team before any NR items, or material/parts store provisions are resolved. By using FleetCycle’s Production Control application via computer screens, these conversations are rapidly expedited. “This customer now carries out its morning review of 12 aircraft within 15 minutes,” says Revie. “Dashboards further increase MH efficiency because the team is back on the shop floor and able to carry on meeting the day’s targets sooner than before.”

Dashboards also allow organisations to filter out redundant information that may waste time in management meetings. An example is the status of materials: a dashboard will show the logistics



department meeting its targets. No time is wasted in establishing this during a morning review; the maintenance dashboard simply shows that all materials and logistics requirements for each check are being managed.

All available dashboards can be updated in real time and automatically synched between the MRO's PEDs and the FleetCycle software. If the customer uses paper and electronic maintenance documentation, the dashboard will refresh once the mechanic has input task updates into a terminal. This can compromise the dashboard's effectivity, since human error can affect the status of an MRO provider's operation.

By incorporating the base maintenance dashboard as part of their daily review, Revie says that some of its customers are reducing shop visit TATs by up to 25%. "The dashboard is making customers more efficient at planning checks," he says, "while overlaying with historical data allows continuous improvement."

According to Revie, most of EmpowerMX's customers are still scanning paper taskcards and using barcodes, allowing the near real-time update of dashboard information. "One airline customer has started managing its maintenance in-house, and while relying on third-party providers to carry out the maintenance, is looking to move to electronic processes," he adds. "To

achieve this, the airline sends a team of three or four people to visit the MRO during the check. The team's aim is to get the MRO provider performing consistently across each check, so that the airline can establish the timeframe, labour and costs to expect on average per base maintenance visit." This information is then entered into FleetCycle via the team's PEDs, forming historical data to monitor future work, and an overview of the check status of each aircraft the airline has in maintenance. This allows its maintenance control department to monitor the work being carried out, see tasks in progress and gain as near as possible real-time monitoring via the dashboard. "Our customer is working to get the MRO to update PDF taskcards independently as the next step, before providing the MRO with PEDs as part of ongoing contract agreements," says Revie.

## Summary

While dashboard formats are likely to remain the same for the foreseeable future, even with increased use of Big Data Analytics, the intelligence to be gained for maintenance shops is vast. Electronic processes, combined with Big Data, help to maximise business efficiency. "Modern aircraft are more connected than ever, so more data is being collected at the source," explains

EmpowerMX's Production Management dashboard is often displayed by many of its customers via large screens, to be made visible across the hangar floor. It is this dashboard that provides maintenance check status updates across the MRO.

Martin. "Pair this with maintenance data and the amount of potential insight available to customers is significant."

"Big data has many meanings. To us it means that human capacity to understand the meaning of data is soon ending and we need computers to collect, filter and interpret data to make it into knowledge," adds Ouweneel. "Data in itself is dumb unless we turn it into intelligent information. The aim of MROair is to turn data into informative dashboards that will help to steer a business 'in the moment'.

"Predictive behaviour is possible in an MRO environment once we have all data digital, available and understandable," Ouweneel continues. "An example is the relationship between aircraft health monitoring (AHM) and MRO operations. An aircraft in the air will send information about required repairs; and before it lands, manpower, means and materials are in place to fix the problem within its TAT. This is where presentation on a dashboard can reach new levels of capability and use. So data from aircraft can be instantly combined with data from M&E systems, providing up-to-date information on manpower, materials, and tools." MROair advises that for data to be used efficiently, digital processes are essential, information on dashboards must be taken seriously, and acted on.

"Big data is also airlines' attempt to make data visible company-wide, and increase its intelligence by aligning it with historical data," explains Revie. "If this knowledge can be passed to the wider industry, then this intelligent information can be used to its full potential."

Electronic processes can pose a problem for some lessors and banks, which can still insist that maintenance providers use paper records. Reed advises that this is becoming less of a problem now. Within their customer bases, many lessors are now happy with all-electronic records. Some still require paper records of airworthiness directives being done, which is not significant, given the perception of e-processes of just two years ago. "The ROI speaks for itself and the dashboard is a risk-free and highly complementary addition to the complex and core capabilities of a sophisticated M&E system," says Reed. - CLD 

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