

There are a significant number of financial and customer service challenges to be handled for companies competing in the MRO market. This drives a number of additional requirements for software systems used to support these organisations. These systems are reviewed.

Software systems for third party maintenance facilities

Over the past 20 years, airline maintenance has undergone a huge transformation. Outsourcing, spin-off facilities, joint-venture companies and lean process development are trends that have led to aircraft maintenance being carried out by more efficient, financially driven, business-led organisations. The third-party maintenance, repair and overhaul (MRO) market comprises independent or semi-independent organisations that rely heavily on a mix of customers to continue to make money and stay in business. Not being part of an aircraft operator's organisation means that different things are needed from a core enterprise software solution.

Framing the issues

The starting point of every MRO job is a commercial contract for a scope of work for an agreed price, or at least an agreed financial mechanism to cover the unavoidable uncertainty of maintenance. A project's complexity and risk need to be managed if it is to be profitable, and systems are needed to support this.

The third-party MRO facility has to sell and market itself to the airlines. To stand out from the competition, a facility needs to understand a customer's needs and market dynamics, and their internal position in terms of cost structure and support in estimating costs, committing production slots, scheduling work and managing customer relations throughout an aircraft check.

An MRO facility also has to deal with more than a single internal customer. Balancing the priorities and needs of each customer contract is important for the future growth of the company and requires different types of data collection and analysis by the IT systems.

Historical perspective

The issues outlined above drove third-party MRO companies and airlines in the 1980s and 1990s to adopt a new approach to IT systems known as enterprise resource planning (ERP). The term ERP was introduced by the research and analysis firm Gartner, and was an extension of material requirements planning (MRP) and Computer Integrated Manufacturing (CIM).

Several large IT companies developed solutions for a range of industries. SAP is now one of the dominant ERP suppliers in aerospace and other markets.

An ERP system is based on a modular software design and common database which should allow every department of a business to store and retrieve information in real-time. The information is therefore reliable, accessible and easily shared. The modular software design means a business should be able to select the modules they need, mix and match modules from different vendors, and add new ones of their own to improve business performance. Ideally, the data for the various business functions are integrated. In practice the ERP system may comprise a set of discrete applications, each maintaining a discrete data store within one physical database.

SAP has modified its approach over the years, but still aims to provide a comprehensive solution for MRO service providers. SAP works with MRO user groups to refine requirements and share experiences gained from the installed base of users, and to develop best practice by working closely with MRO service providers and software partners.

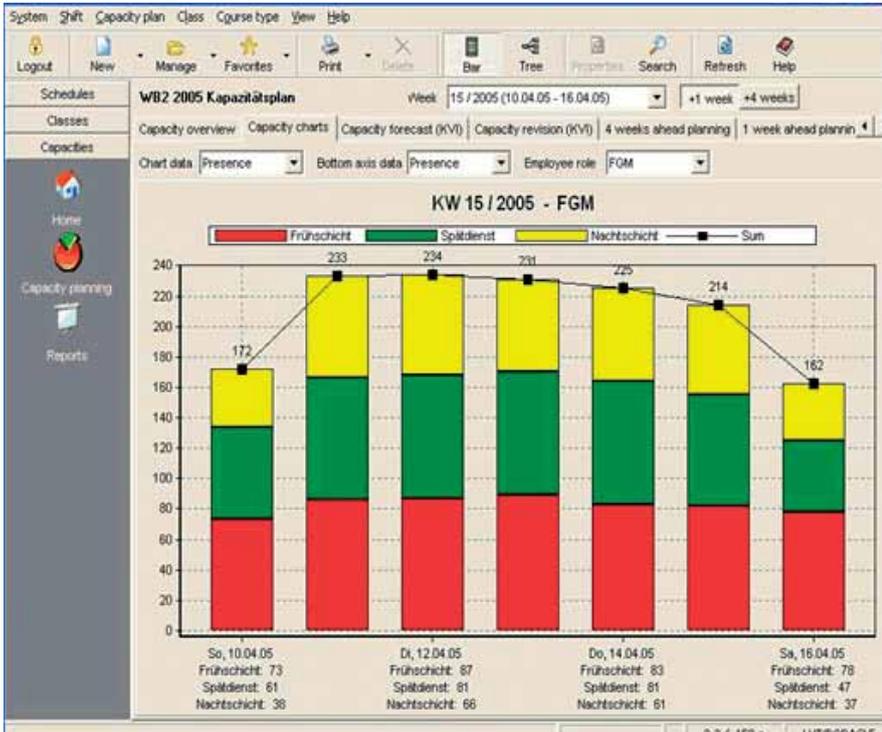
SAP's set of MRO solutions supports line, heavy and engine maintenance and component repair processes. These operations are powered by the SAP

NetWeaver platform, which integrates systems running SAP with non-SAP software. While competitors say ERPs are ill-suited to the complexities of MRO, SAP claims that tighter integration and higher visibility of information are two of its strongest benefits. It is trying ERP solutions that can reduce the number of interfaces significantly. Materials management, warehouse management, finance, HR and shop floor operations of MRO are combined in one system. To drive decisions, management needs more information than just the planning and execution typically provided by the best 'pure play' software. It needs to know about its supply chain, skills and HR.

SAP for Aerospace & Defense supports MRO providers in key business activities, including asset life-cycle management. SAP solutions enable maintenance engineers to manage physical assets and equipment, from the initial investment idea to the end of operation and replacement of assets. They can manage physical assets, equipment, and engineering changes over the complete life-cycle to optimise equipment performance and availability. SAP maintenance and service planning is performed for both mid- to long-term forecasting and scheduling of major checks for aircraft and components.

Third-party MROs can schedule service areas such as hangar bays, and simulate business alternatives and the effect they have on service schedules and resources.

SAP supports all maintenance levels. For line maintenance the software can plan and execute maintenance services while an aircraft is assigned to the revenue schedule. The system gives a view of all new, deferred and cleared work items for an aircraft, which provides a longer time window for planning and assigning them. For heavy maintenance,



SAP solutions allows a third-party MRO to manage maintenance in aircraft hangars, including most scheduled inspections, checking and alignment tasks, engineering orders, deferred work items, and additional work arising during the aircraft's visit. The company can plan, package, schedule and monitor maintenance tasks, and can track the real progress of inspection results, production data, and configuration changes on the shop floor. The big advantage is that all the finance and HR aspects of the operation are integrated with the operational and transactional functionality needed.

Airlines with large third-party businesses, such as ANA, Air France Industries, British Airways (BA), Delta Airlines, Japan Airlines (JAL), Lufthansa Group, Singapore Airlines and Varig SA, tend to choose a core SAP backbone solution, which they then enhance with specialist tools like ClickCommerce for optimising spare parts.

SAP claims that most savings for third-party MRO companies come from financial management, tighter control of costs and more accurate customer billing, and that their ERP approach delivers more efficient utilisation of people, assets and facility space. While this may be true for larger organisations, it has to be set against the time and cultural changes needed to implement a major new software system. Most SAP implementations take many years to get right and come with a hefty price tag.

Best-of-breed strategy

Another approach to providing an IT solution for third-party MRO is to become a specialist provider of software.

This narrower focus means the software company provides limited functionality, which it develops for a market niche so that it becomes an expert in the business domain. These 'pure play' solutions are typified by Canada's Mxi Technologies. Evan Butler-Jones, product marketing manager at Mxi Technologies, describes its Maintenix product as 'integrated, intelligent software that offers a solution to maintenance, engineering and materials management challenges'. Since its release in 1998, Maintenix has become a fully web-enabled J2EE solution that offers a robust solution for MRO operations.

"The primary processes that MROs want to improve generally vary based on the set of systems they currently have in place," says Butler-Jones. "Some are looking to improve the strategic planning process, others more tactical processes, such as tracing parts requested by the mechanic from purchase right through to installation. Mxi's Standard Airline Solution offers an industry best-practice approach for nearly 100 typical MRO/airline maintenance processes and sub-processes.

"Generally, the most critical process needs tend to fall into three categories. Compliance-related needs include maintenance programme management, and tracking work done," says Butler-Jones. "This relates more to MROs providing full engineering management. Second is planning. This means improved resource visibility, long-term strategic direction, and increasing planning efficiency. The last part is traceability, which provides 'cradle to grave' tracking of rotables and repairables to provide control and quality management.

"Our airline customers managing in-

MINT Interactive Media is used by third party MROs like Lufthansa Technik to improve resource planning and management. The product is developed specifically for the airline regulatory environment.

house work have many of the same challenges as those running external MROs, but with some simplifications," continues Butler-Jones. "Strategic planning and logistics activities are generally reduced to meeting the needs of a single operator, instead of considering variables such as differing maintenance intervals, or customer-supplied parts."

Airlines providing external MRO services have completely different process sets that must be considered in addition to typical airline ones. In-house MRO airlines tend not to place a high priority on controlling non-routine budgets and projecting slot availability based on contracted work. The most obvious cost savings are those that directly affect worker efficiency. By standardising the execution and support processes, and putting information directly in the hands of their mechanics, planners and logisticians, organisations can drastically reduce the time spent inputting, extracting and managing information. By automating information workflow between mechanics and engineers, non-routine analysis becomes a real-time, on-line activity, where engineers can view digital photographs of damage or corrosion within minutes of discovery.

Just putting electronic job information directly into the hands of mechanics can result in huge efficiency gains. "Executive Jet Management (EJM), an MRO which has recently implemented an electronic signature and record-keeping solution using Maintenix, has provided mechanics with computers on the hangar floor," says Butler-Jones. "This has minimised the time spent signing off job cards and researching procedures, and has reduced support labour overall. Efficiency gains vary by customer, area and department. Some of our customers already have very sophisticated execution systems, and have made the most gains in planning, while others, like EJM, have improved the mechanics' interaction with the system.

"Efficiency gains can be predicted by determining how many processes will be enabled in the new system that were previously managed manually. For example, one of our customers' business units now has 50% of its processes enabled in its legacy system in its new Maintenix implementation, up from 20%. This drastically reduces the time workers spend managing information, and greatly improves management's operational visibility.

"Operational growth versus

headcount is a very direct indicator of this," says Butler-Jones. "For example, by achieving a similar increase in system-enabled processes, the fleet management group within EJM had 100% fleet growth, while increasing staff by 25%."

Going it alone

Some companies take the do-it-yourself (DIY) approach. With a large base of skilled, low-cost IT staff, this strategy could pay dividends if executed flexibly. The problem with DIY development, however, is that 100% of the cost of creating and maintaining the system is borne by the company itself. It is also reliant on internal staff knowing and understanding aircraft maintenance best practices. No new technology or ideas are shared without the company initiating the process itself.

Examples of this strategy can be seen with Hong Kong's HAECO. Building upon an existing backbone system, it has a pool of low-cost Chinese developers which can develop a new technology version of the existing solution. The company retains full control of setting priorities for itself, and the costs are marginal since many of the staff are needed elsewhere in the business. The implementation timeframe, and overall business risk of relying on an internal supplier, is ever-present. Another airline going it alone is Flybe, based in Exeter,

UK. It offers base and line maintenance, and component overhaul and engineering services for a range of regional airline customers. Flybe developed an Oracle-based electronic task management system (ETMS), which it continues to develop.

Specialist add-on tools

While a core system, whether bespoke, ERP or off-the-shelf best-of-breed, is important to run most key business processes, many of the best and most successful third-party MROs, such as Lufthansa Technik, add specialist IT tools. As a global player, Lufthansa Technik carefully observes the different regulations and a constantly changing record-keeping environment. Several years ago, it needed a system to help it fulfil the authorities' requirements on record-keeping for staff certification, and to give it the capability to administer and allocate about 6,000 qualification documents. "MINT's long and extensive experience in the aviation industry thoroughly convinced us", says Roland Lauer, area manager IT systems and user support in Frankfurt at Lufthansa Systems. Lufthansa Technik implemented the MINT Resourcer to document staff qualifications, internal skills and training, as well employee development.

One highlight of the system is that MINT Resourcer automatically submits extracted record data to the German

Aviation Authority 'Luftfahrt Bundesamt', thereby intelligently simplifying the licence-issuing process and radically reducing cost. Shortly afterwards, MINT Shifts was implemented to schedule fixed and flexible shift roster-planning and all kinds of training, and preview the capacity and authorisations required in the future.

To find cover for absent employees on outside locations, the MINT Station Designer compares the station's profile with employees' records and provides the most suitable substitute. What makes the MINT solution valuable to a third-party facility that already has a tailored SAP solution? "Capacity planning would be possible in many systems, but due to the airline industry's very specific needs it is of great value to have a system with an aviation background," Lauer emphasises.

Optimising human resource usage and space utilisation is key to making money in the third-party business model. Several solutions can be added to a core MRO software package to enhance this area of management control. One of the best tools in its class for this job is 4Sight, based in the USA and now also in Spain and South America.

The software suite is called Enterprise Management 360, which 4Sight says was created to replace legacy ERP solutions, while integrating with multiple existing platforms. It is an end-to-end solution to help organisations seeking continuous



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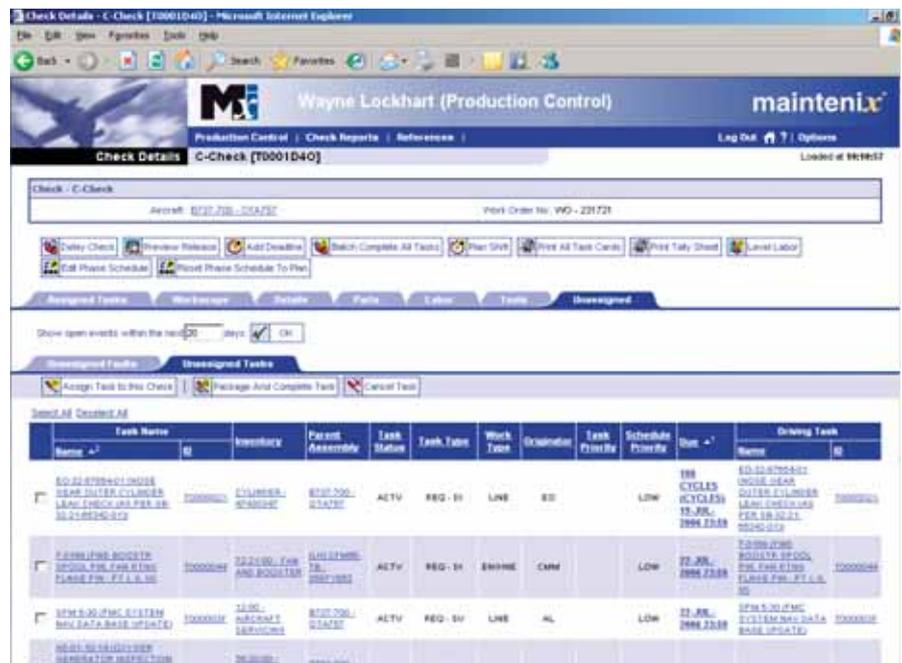
- Scalability
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Mxi is one of the leading specialist software providers. The web-based system is easy-to-use and has been developed specifically for the airline market. Here is a typical production management screen.



process quality and productivity improvements by optimising resources and minimising time-delays, inadequate strategic planning and poor processes.

4Sight aims to provide a rapidly deployable, cost-effective offering. This solution's efficiencies simplify workflows and have an immediate impact on the return on investment, making it ideal for organisations of any size. The software is web-based and EM360's capabilities provide a cohesive management approach, linking other critical functional areas of the company and providing a proactive two-way communication tool. Web publishing delivers end-to-end customised report publishing via the web, without special viewers or software plugins. For a higher degree of collaboration and communication, 4Sight has state-of-the-art technology for report publishing, allowing for design and presentation of critical project information and capturing and accessing this information in 'real time' via the web. Web publishing provides increased project visibility and improves communications throughout the entire organisation.

4Sight's strategy is to continue using this new global and open business model to promote the growth and expansion of all proven project management and scheduling techniques.

Built for smaller scale

AD Software is a French company that offers a slimmed-down solution for smaller MRO facilities and organisations. Its AIRPACK suite meets the needs of the MRO that wants to manage both 'classic' MRO and airworthiness follow-up.

"We offer a full range of functionality from documentation update, checks preparation and scheduling, alerts planning and controls, work recording, provisioning, mechanics planning, customer acceptance and check follow-up, including easy transfer of data back to the customer," says chief executive officer Frédéric Ulrich. "Most MROs manage an additional full airworthiness activity and our system supports that.

"Our system is modular. AIRDOC stores, retrieves and prints any document like job cards, EASA forms, and 'dirty fingerprint' copies. The big benefits are time savings while editing an aircraft check follow-up. Assets are maintained by continuing traceability. In our

AIRSTAT module, users can build their own reliability reports, including automatic daily or monthly printings. The benefits include automatically inserting job card descriptions for each check, so it takes less than 10 minutes to print a full work pack for an A340 'A' Check with all aircraft maintenance manual cards. The user interface is 'what you see is what you get', which saves time and user frustration.

Not forgetting the customer

Much of the discussion so far has been about improving management of the internal third-party MRO processes. Of equal, if not more importance, is making it easier for the end customer to work closely with the third-party provider and ensure easy data interchange between customer and supplier.

Lufthansa Technik's unique Technical Operations WebSuite, called manage/m, allows commercial aircraft operators to manage all core functions of their fleet's technical operations as an entirely web-based management tool. Rounding out Lufthansa Technik's all-encompassing portfolio of MRO services, the modules of manage/m comprise a complete range of airline-proven support functions that allow operators to fulfil their responsibilities towards the aviation authorities. In addition manage/m is ready to go and does not need any IT investment on the part of the airline. It comprises a portfolio of WebServices that can be selected to control many aspects of a fleet's technical operations on-line, such as quality monitoring, reliability trends, status reports, documentation and tracking of shop events in real-time.

In the current economic climate, more and more airlines are looking for quick

and reliable Technical Operations Management as a key to their success. Aviation authorities demand that an airline has full control of its technical operations, even if it has outsourced the entire MRO work. By using manage/m an airline can meet these requirements without having to retain in-house engineering staff. Lufthansa Technik also claims that manage/m incorporates more than five decades of its extensive MRO experience, bringing the corresponding established quality standard to the customer. The implementation timescale is short and security is assured using the latest encryption technology.

In summary

Managing any customer-supplier relationship is challenging, and this can be too much for organisations without a software system in the complex world of third-party maintenance regulation and competition. MRO companies need a different system to in-house airline facilities, and this is reflected in their choices of system providers.

"We will continue to see automation of previously manual activities, and standardisation of workflow that was previously managed offline," says Butler-Jones. "A maintenance management system cannot reduce the time it takes to physically change a part, or carry out a repair, but by properly studying the processes and management metrics that support those activities, we can ensure that they are performed at the optimum time in a check, and in the overall context of an optimised support structure with a streamlined information flow." **AC**

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