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# NAVIGATING ENGINE MRO: COMPLEXITY TO COMPETITIVE ADVANTAGE

HOW INTELLIGENT ENGINE MRO SOFTWARE PLAYS A KEY ROLE IN CREATING A DIFFERENTIATION FOR ENGINE MRO SERVICE PROVIDERS?



Reduce cost and TAT in MRO operations | Improve your customer value proposition Create a sustainable competitive advantage



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## **★ EXECUTIVE SUMMARY**

Engine MRO service providers are faced with some unique challenges given the inherent complexity in their processes, the low margins they have to work with and a constant pressure to honor TAT commitments. With the covid pandemic hitting the world, financial pressures on airlines mounted, changing the airlines' priorities, making them more cautious about spending — especially where MRO activities are involved. This further compounded the engine MRO service provider's troubles.

Most of what happens on the MRO's shop floor is overwhelmingly touch dependent – MRO operations rely on human interactions, which introduces all the problems associated with manual labor and processing. Excel spreadsheets or worse physical paper files are pushed from one desk to another, which adds to the turnaround time. Legacy systems complicate the situation further since they are quite limited in their technological capabilities and fail to deliver high-impact value. Such systems are mostly disintegrated and work in silos. Where new-age software does exist, there is often one ERP software for back-office processes, one for the shop floor, and neither links seamlessly with procurement, logistics, and financial ERP systems. The vulnerabilities that exist in the engine MRO service provider's organization have become more glaring post-covid, accelerating the need for digital transformation, automation and digitization of technical documentation. There is a need for a sustainable solution that balances cost and TAT while helping engine MRO service organizations unlock revenue-generating opportunities. It is the only way to establish a competitive advantage for the long-term, with better control on the shop floor processes, reduction of manual tasks and paperwork, and better insights through analytics, thus empowering the Engine MRO leaders with the ability to make intelligent strategic decisions proactively.

In this white paper, the Aviation experts and SMEs at Ramco explore the current situation that faces the engine MRO service providers — specifically analyzing why engine MRO activities are so time-consuming and expensive. Engine MRO companies will also discover how a technology-based systems approach to handling TAT and cost considerations can have a visible, quantifiable, and long-term impact on both direct and indirect costs as well as improve their value proposition while allowing them to service their contractual obligations to the fullest.

## ✗ UNDERSTANDING THE CURRENT CONDITIONS

Oliver Wyman predicts that the compound annual growth of the MRO sector will be 3% between 2019-2031. There will be lower demand in the near time as pandemic recovery takes place, with long-term growth prospects. The MRO demand is expected to fully recover by 2023, reaching \$115 billion by 2030.

Preserving their finances is one of the top priorities for airlines. When they reach out to MRO service providers, the expectation is always faster TAT at the least possible cost to minimize revenue losses. This places engine MRO service providers in a difficult position. They have to save costs, deliver results faster and do everything that is contractually expected of them without comprising quality.

Before we can answer what is it that engine MRO service providers can do in this scenario to deliver successfully on their commitments made to airlines, we have to consider what influences the cost and turnaround times in engine MRO activities.

#### Factors Inflating the Cost and Increasing TAT for Engine MRO Service Providers

MRO operations are complex. Inspection and diagnosis of an engine involve a lot of paperwork and where paper is involved human error is sure to follow. Moreover, technicians are the ones who come up with the time and cost estimates for the job, making the workshop planning and estimation process a manual activity. The time taken to compare various configurations and templates and to arrive at a potential target configuration can be long. Arriving at an overall cost based on the planned labor hours and potential non-routine hours manually may not be very reliable and makes the estimation process itself time-consuming, inflating the overall turnaround time.

There is also the concern associated with predicting non-routine maintenance jobs. The workload of upcoming repair jobs is difficult to know beforehand as oftentimes the only way to figure out the exact damage or extent of repair needed is by taking the engine apart. Such unpredictability means that it becomes difficult to establish a standardized repair process and assign resources in advance. Only after disassembly can the engine MRO service provider figure out which equipment and people are needed to get the job done. MRO companies are forced to wait until they have had a look at the engine to order any spare parts which add to the turnaround time. Production planning and scheduling thus tend to be manual. In case the work scope changes or new defects are found, re-balancing the production plan goes the manual route. New approvals are sought, parts ordered, new technicians assigned - all adding to the TAT.

Once the repair job is on, MRO operators have to keep a tab of each sub-module and the associated work order. Paper-based processes only add chaos at this point. During assembly and testing, detailed technical reports of incoming and outgoing parts have to be managed, with guality checks and compliance with contract terms having to be maintained to ensure that all parts are correctly delivered to the airline. Both the engineering and technical records department are involved in this stage and they expend a lot of time and effort to process the OEM's technical documents like the Service Bulletin and Information Letters. There are also manuals like ESM, SPM, etc. to be managed. A new set of technical documents for a particular engine type might turn up, and then there is the ongoing, incremental revision to be done to these documents. The file formats of such documents vary - an XML/SGML-based document is easier to ingest and the output can be rendered in HTML for an interactive experience. PDF files on the other hand are time-consuming to process.

A lot of such processes – right from workscope planning to work execution to maintaining and updating technical documents, happen in disparate systems with sub-optimal interfaces. There is a constant need to call or message or email people – making the process quite disorganized and clumsy.



### Key facets of Inefficient Processes

What emerges from this scene is that in most cases facility capacity is inefficiently utilized by the engine MRO service providers. One reason for this is the use of manual planning tools and non-standardized files like excel spreadsheets and PDF documents. Not only do such files reside on a specific person's desktop or laptop at any given time, but they also undergo constant to and fro from manager to technician to external stakeholders. Version changes happen all the time and it is almost impossible to get any control over the data in real-time. There is simply no bird's eye view of the whole scene taking place on the shop floor in real-time.

Another facet is that most things are operating in their own silos. There is a lack of data integration and cross-functional collaboration like say between the engineering and procurement department, or the logistics and the accounting divisions is missing. Not only is there immense scope for automation and optimization here, but also, MRO service providers are losing a vast amount of intelligence because they interact outside the system – losing out on precious data that can be used for intelligent analysis.

Fulfilling contractual obligations with their customers require MRO service providers to balance TAT and cost pressures together smartly. The solution for navigating such turbulence is to –

- (i) Take a broad, systems-based approach with the help of intelligent enterprise-wide technology systems
- (ii) Collaborate with all the stakeholders on a near real-time basis
- (iii) Achieve reliable TAT performance by harnessing data with the use of an advanced analytics engine

## ✗ ROLE OF INTELLIGENT TECHNOLOGY

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Think of the ideal state for an MRO service provider – one in which all the people, processes, and data are connected together into a single, integrated ecosystem. Such an ecosystem makes collaboration in real-time possible, it involves all the stakeholders in the value chain and it offers an unbeatable advantage – that of knowledge that can be applied for quick decision-making.

What engine MRO providers need in order to achieve this is the right MRO IT solution that can integrate their entire MRO ecosystem front-to-back. Integration is so critical because engine MRO service involves a complicated process with too many cogs and wheels, all of which have to be well-oiled and running to ensure that the entire system functions smoothly. Any misstep can be a cause for delay or disaster. Any additional hour spent in human conversation, response or approval, is an increase in the TAT. Any unpredictability will add to costs — both direct and indirect.

Let us look at how engine MRO service providers can unlock some powerful advantages for themselves in the current situation. Integrated IT system throughout the MRO enterprise

An integrated enterprise-wide IT solution for engine MROs can introduce a high level of intelligent automation, especially for non-routine jobs on the shop floor. The greatest application of this is in predictive maintenance. Engine MRO operations generate a vast volume of data — and where data is available in plenty, machine learning models can be built and trained to learn from human behavior and system interactions. This allows the system itself to make smart predictions about when a possible job could come in next, which spare parts are most likely to be in demand and what the associated costs and risks of any unanticipated event might be. This increases the engine MRO service provider's operational reliability since they are able to anticipate engine maintenance needs even before a component on the engine actually fails. This makes it easier for them to maintain just the right spare parts in their inventory while allowing airlines to proactively schedule maintenance even in cases where a malfunction has not yet taken place, in order to keep their fleet running on schedule.

Another advantage of automation is that indirect costs associated with maintaining paperwork can be reduced. By setting up the right electronics publishing tools, documents can be uploaded into the ERP system in say, an XML format, and the content can be parsed. The parsed content can then be used for taking out the bill of materials, warnings, proprietary learnings, and even photos or videos to efficiently execute a job since indexing and categorization make documents more accessible and less time-consuming to retrieve and refer to.

Such a level of automation and the digitization of OEM and technical documents allows MRO operators to dynamically balance requirements coming in from the shop floor as the work scope changes or new defects are uncovered, in near real-time. Add to this the capability associated with machine learning and the system can make smart proactive decisions. Production planning and scheduling can be adjusted automatically based on the feedback coming in from the shop floor in real-time. This means that as the workscope changes or new findings are uncovered, schedules can be automatically adjusted, matching the right job to the right technician. This improves the overall productivity of the job and the quality of the final output.



In order to optimize and improve the productivity of operations, it is important to keep all the stakeholders — from mechanics to managers to storekeepers — connected to each other in real-time. The only way to do that is by allowing every resource to use the ERP system on a device of their choice — whether it is a desktop, laptop, mobile, or tablet. The use of physical paper or even digital files can severely limit the extent to which interactions can happen in real-time. For this reason, it is important, and even imperative, to empower the different stakeholders in the value chain, especially those on the shop floor, with a mobile app that is integrated with the enterprise-wide MRO system. This has multiple use cases. One, people on the floor can access technical documents seamlessly since they reside in a central repository. Two, they can connect with the supply chain departments and request components or equipment by placing a request from the shop floor itself. Three, unstructured data like video, audio, or even noise associated with a malfunctioning engine part can be recorded and attached to the logs, making the entire troubleshooting process much faster and insights-oriented. Four, any approvals required can be easily raised and accepted (or rejected) via mobile apps through digital/e-sign-offs.



An interactive medium between the airline and the MRO operator can unlock a great advantage for both. Through a customer portal, any additional approvals that the MRO operator requests can be immediately approved by the customer. No emails or calls are needed to see the status of a job, and everything can be updated in almost real-time. With the aid of an automated configuration system, the customer can be kept in the loop at all times regarding what is happening on the MRO operator's end — which parts are in transit to the MRO's shop floor, which ones are undergoing repair, and which parts are outgoing. This level of visibility and transparency between the airlines and the MRO service providers increases trust between the two, makes the entire MRO process more result-oriented, accountability increases, and of course, a base for a sustainable, long-term partnership is established.

#### Improve service levels and transparency

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Both structured and unstructured data carry immense value — especially where the analysis of non-routine activities is concerned. We have already seen how analytics makes predictive maintenance possible. Another use case can be found in providing estimates of work orders to the customer. Where previously the MRO's staff had to first inspect the engine before coming up with time and cost-related numbers, now analytics can be used to provide estimates based on historical work information. Such estimates can be calculated quickly and tend to be more accurate than manually derived numbers. Additionally, critical KPIs related to TAT, cost, resource utilization, etc. can be computed dynamically, eliminating manual consolidation, thus saving time while improving transparency manifold.

To deliver bottom-line results to its customers, aircraft engine MRO companies need intelligent enterprise software that is designed to streamline and automate their operations. This includes integrating together the functions associated with customer opportunity assessment, contract planning, executing maintenance and repair activities, performance reporting, and invoicing.



## **≭ FUELING FOR THE LONG-TERM**

One of the biggest benefits of digitization is to make data and documents available digitally to operators, mechanics, technicians, managers, and customers on a device of their choice, at all times. This improves

the flow of data between different stakeholders and puts information right into the hands of those people who can make decisions that eventually impact TAT and cost.

	Consistent TAT	Maintenance planning	Inventory management	MRO IT	Outsourcing	Potential reduction		
Overhead Costs	0	0		0		8 - 17%		
Outside services	0		0		0	7 -10%		
Materials		0	0	0	0	5 - 8%		
Direct labour	0	0		0	0	5 - 20%		
Total cost savings of MRO 8 -15%								

#### **Chart M. Typical benefits realized**

Minor impact Major impact

Source: Deloitte Benchmarking



### Some of the benefits of having an integrated enterprise-wide MRO IT system in place include –

- Increased operational reliability
- Improved maintenance planning
- Improved use of the MRO facility's capacity
- Improved flight safety by forecasting maintenance requirements
- Improved troubleshooting procedures
- Reduction in unscheduled shop visits
- Reduced inventory and smarter procurement
- Reduction in the non-production time that is usually spent in accessing materials, technical documents or in waiting for managerial and customer approvals
- Paperless operations with both structured and unstructured data emerging, which provide real-time insights into cost, quality, and TAT metrics
- Secure data delivery across the value chain from customers to the shop floor to the MRO operator's back-office
- Harnessing the value of data to accurately find out what the progress of a work order is, where the delay is happening, etc.
- Applying machine learning algorithms over data which proactively recommends the next best steps to take
- Consistent turnaround time
- Increased service levels and higher customer satisfaction
- Enhanced customer value proposition for an engine MRO service provider with demonstrable, tangible benefits

## ★ BEST PRACTICES FOR SELECTING THE RIGHT ENGINE MRO IT SOLUTION

To realize true top-line and bottom-line benefits, engine MRO service providers should invest in a comprehensive MRO IT solution that is completely integrated front-to-back.

Ramco, in consultation with its customers and senior aviation leaders, has created a checklist

that engine MRO service providers can use when evaluating engine MRO IT platforms. Ask these questions of your technology partner when embarking on an integrated MRO journey.

#### CHECKLIST FOR EVALUATING MRO IT SOLUTION PLATFORMS AND PROVIDERS

#### How well integrated and connected is the proposed MRO solution?

- What interfaces are available that connect the proposed ERP platform to other applications?
- Is there a seamless flow of data between different modules? e.g. between Maintenance, Engineering & CAMO, Supply Chain, Compliance, Flight Operations, MRO Sales, Manufacturing, Human Resources, and Finance.
- How easily and effectively can the engine configuration be recorded and tracked?
- What level of control (e.g. complete or partial) is available on parts with different ownerships?
- Are global warranty and parts tracking available in real-time?

#### How easy is it to use?

- Is the platform available on the web, mobile, and tablet with a seamless connection between them?
- Is the platform intuitive to use with quick onboarding and user training?
- Is there an option for a customer portal?
- Are chatbots or voice assistants available?

#### What intelligence can I get?

- Does the platform make automated, smart recommendations powered by AI and machine learning?
- What are the different reports that can be generated using the platform?
- Are insights available in easily digestible formats? e.g. dashboards, graphs, charts, downloadable reports in pdf, xls formats?
- Can the system leverage both structured and unstructured data to deliver insights?



### **Case Study**

One of the largest Engine MROs in Europe realizes a significant reduction in their order-to-cash TAT with an intelligent MRO solution

#### **Requirements**

The client needed support for its core MRO processes in the engine shop like engineering and supply chain. The client also wanted certain other processes like finance, procurement, and HR functions to be connected to the ecosystem for a more cohesive and smoothly running MRO process.

#### **Client Goals**

The client had the following objectives in mind that they wanted to achieve –

- 1. Reduce Order-to-Cash TAT
- 2. Increase business process efficiency
- 3. Have a more productive workforce

#### **Solution**

The client collaborated with Ramco and selected the Ramco Aviation for Engine MRO solution for meeting its complex MRO requirements.

### **Solution Capabilities**

Engineering and Maintenance – With automation, the client was able to go paperless and have complete accessibility to all documentation anytime, anywhere. They also gained improved visibility into their operations getting better control over their processes and workforce. They also improved their compliance.

**Supply Chain** – With close integration between operations and supply chain, the customer was able to communicate with different stakeholders in the system in near real-time, increasing the overall efficiency of the workforce.

**Contract Management** – The customer was able to define the work scope including SLAs, what is excluded from the scope, and defined all the requirements that could impact the production process, upfront.

**Invoice Management** – With extensive invoicing features the customer was able to generate accurate invoices in a timely manner, speeding up the customer invoicing process and reducing financial leakages previously attributable to delayed invoicing.

#### Impact of the Integrated Engine MRO IT Solution:

- Improved compliance and control over the MRO operations
- Better control over cost and revenue leakages in real-time
- Minimized wastage within the organization
- Reduced the order-to-cash turnaround time





#### Blast Your Way Out of the Turbulence

Engine MRO service providers have a unique situation in front of them. In the wake of the pandemic, the trends associated with digital transformation have accelerated – an advantage that engine MRO service organizations must take to effectively manage their cost structures and leverage new opportunities that are predicted to come up in the next ten years.

However, complex processes mired in manual efforts, the lack of data integration, the unpredictability of work orders, varying formats of technical documents and the unavailability of cross-functional collaboration all introduce revenue leakages. Manual workscope planning and production scheduling techniques are not enough to handle the current situation.

An intelligent, unified and integrated platform is needed which can serve as a control tower for the MRO providers. The flow of data and collaboration between the different stakeholders in the system needs to happen in near real-time — from discovering new opportunities, to processing data coming in from various sources to making sense of both structured and unstructured data and using it for smarter decision-making all of these need to become part of the new MRO IT landscape.

At the end of the day, engine MRO companies need digitization, automation, optimization, and intelligence to handle the cost pressures. The ultimate benefit of having a comprehensive and integrated MRO platform in place is that it has the potential to reduce both TAT and costs while uncovering new revenue-generating opportunities by leveraging data-driven insights, ultimately turning the MRO function into a profit center.



Ramco is a leading provider of enterprise solutions. Ramco's Aviation for Engine MRO is an integrated product for Engine MRO service providers looking to create a sustainable advantage while balancing their cost and TAT factors. We are focused on innovation, creativity, and collaborative culture with our customers to create sustainable advantages for them in the post-covid world.

To know how Ramco can help you create business value for your organization, feel free to reach out to **contact@ramco.com**