

While all elements of aircraft maintenance work have been sub-contracted, most airlines still prefer to retain control of maintenance management tasks and perform them in-house. There is a growing willingness by airlines to sub-contract these management tasks, and retain a bare minimum of management personnel.

Outsourcing maintenance management functions

The practice of outsourcing many of an airline's functions is not a new one. Almost every aspect of an airline's commercial operation can be outsourced, and there is barely a single airline that does not outsource at least some of its maintenance & engineering functions. Only maintenance & engineering management has been kept in-house, sometimes because there is a legal requirement to do so, but mainly because doing so makes airlines feel that they remain in control.

The maintenance of an aircraft's airframe, engine and components is so diverse in terms of frequency, and requires so much specialised equipment, tooling, skills and investment that no operator can economically justify doing it all. Classic examples are the most complex and expensive repairs of engine parts, or testing and repairing high-value and reliable avionics. Another example is landing gears and thrust reverser units. The facilities to overhaul these components and items require a large financial investment, and the repair intervals for many of these items can be as long as 10 years. An airline therefore needs to have a large fleet to make carrying out such maintenance in-house economically viable, when compared to the rates of specialist third-party providers.

Outsourcing can vary from a large airframe maintenance provider, which has gained a lot of practical knowledge over time, to small specialist companies that have concentrated on being experts on a few specialist engine parts or components.

While many of the older legacy airlines have built up large maintenance & engineering departments, many regional and smaller airlines do not have the capital to invest in such large facilities.

There is the theory that everything, except what legally has to be carried out in-house by an airline, can be done on their behalf by an intermediate aviation consultancy that specialises in maintenance & engineering.

There are several financial advantages to outsourcing maintenance & engineering. First, a third-party maintenance provider can probably do the work more cheaply. Second, the airline needs to invest less money in staff and tooling, and to own or rent less airport land. Third, utilising a specialist company's experiences for a particular level of maintenance can reduce failure rates or aircraft downtime. Some airlines can also divest themselves of their facilities, which will not only improve their liquidity, but also make some elements of their maintenance costs more predictable.

One large airline that has taken such a step is British Airways (BA). It sold its engine shop in Wales to GE Engine Services (GEES), and BA now outsources its engine maintenance to GEES. BA also sold its landing-gear overhaul shop to Hawker Pacific, and now outsources its landing gear overhaul.

Some larger airlines, such as Delta and Lufthansa, have even used their own engineering departments to their advantage and expanded their services to gain economies of scale by offering them to other operators. As Ben Lamzed, director of asset management and technical group at the International Bureau of Aviation (IBA), comments, "If an operator has fewer than five aircraft it tends to outsource virtually all levels of maintenance. When an airline has a fleet of 5-10 aircraft some maintenance will be done in-house and some will be outsourced. Once an airline has 10 or more aircraft, then more and more maintenance tends to be done by the operator itself."

While specialist airframe and engine jobs are increasingly sent to maintenance, repair and overhaul facilities (MROs), even with airlines that have medium-sized or large fleets, there is still more that an operator can outsource. This can include the management functions of maintenance and engineering. The idea of MROs as a one-stop shop is a relatively new one according to Alan Miles, director of regulatory services and training airworthiness manager at IBA. It is now easier for operators to put all their engineering management functions, and most of their maintenance tasks, with one provider. Examples of such providers are SR Technics and Lufthansa Technik. Nevertheless there remain some specialist functions that these providers have to sub-contract.

Legal requirements

European Aviation Safety Agency (EASA) and Federal Aviation Administration (FAA) regulations on outsourcing engineering generally follow the same rules, with the occasional change in titles of senior personnel in airline maintenance & engineering departments. For the sake of simplicity, the European titles will be used throughout this article to explain the legalities.

EASA Ops 1 states that every airline with an Air Operator's Certificate (AOC) must have at least a Quality Manager and a Continuing Airworthiness Director (formerly the Technical or Engineering Director) named on the AOC. No matter what happens after this point, the operator is always ultimately responsible for the maintenance undertaken on its aircraft. It is therefore the responsibility of the Quality Manager and Continuing Airworthiness Director to ensure that all engineering work is completed legally and that they retain control. In other words,



the continuing airworthiness approval remains with the operator at all times.

In addition, the operator has to mention in its AOC exactly which MRO or maintenance provider will be performing which tasks. As Craig Richardson, director of sales and marketing at Total Engine Support (TES), explains, "One of our European clients has referenced TES as an engine maintenance provider, and as a service integrator, in a sub-part of its AOC, but the client still retains complete responsibility."

"Where an airline outsources virtually all its maintenance to one MRO, the MRO effectively becomes the airline's maintenance and engineering department," says Andreas Pakszies, director of aircraft system engineering at Lufthansa Technik.

An MRO cannot then sub-contract to another maintenance provider any on-wing maintenance for which it has been contracted. It is allowed, however, to sub-contract off-wing maintenance to companies such as specialist repair vendors.

Regardless of how much or how little maintenance work an airline outsources, it still needs to have access to all the data and records connected with the aircraft and their engines. Lufthansa Technik resolves this issue by allowing its airline customers to have access to its MRO management system. All the data such as aircraft flight hours (FH), flight cycles (FC), engine monitoring and tasks completed can be seen by the airline's maintenance department, and are therefore readily available for any authority that wants to see them. This

ease of access is important, since the operator still has to liaise with the relevant civil aviation authority and provide whatever paperwork is required.

It is possible to subcontract most, if not all, aspects of maintenance management, as long as this is stated on the AOC. This, according to Richardson, gives an airline the freedom to concentrate on its core business: carrying passengers.

Engineering management

Many management functions can be outsourced, and some of the major ones are discussed below.

Technical records management can be a very intricate and time-consuming job, but it is a legal necessity. Usually an airline will manage its technical records in order to ensure control but, increasingly, larger MROs are now offering this as a value-added service to operators, like many of the management functions, when taken with the MRO's main maintenance packages. There are a few companies, such as FlyerTech, which have made this service their main product specifically for new operators that would find it hard to set up the infrastructure to satisfy EASA regulations. FlyerTech has then gone on to add additional functions that can be offered to new operators.

To undertake this particular maintenance management function, a company would need the right software to enter the data, and trained personnel to carry out the data entry and the correct approvals. This, says Miles, is why many new operators need MROs and companies such as FlyerTech to assist

Maintenance management tasks include providing all up-to-date manuals and parts catalogues, and ensuring a working and reliable maintenance records and records retrieval system is in place.

them. But, as time goes on and an operator's experience grows, this is an outsourced function that is likely to return in-house.

Recording and tracking aircraft utilisation is a primary task. This will automatically be followed for each aircraft by an airline, and although it is not really an engineering task it forms the basis of maintenance programmes and the timing of performing checks. It is still a vital part of engineering management, and something that can theoretically be outsourced. TES says that it expects an operator to manage these data and then feed the information onto TES. TES is then able to marry this all together with its engine data within its engine fleet planning and costing (EFPAC) software, which manages engine removals and maintenance, and sends the results back to the operator. This then allows the parties to see where utilisation improvements can be made. Since this function is part of the planning department, it should be easy enough for airlines to do themselves. Miles says that planning is rarely outsourced, since it is one way for an airline to retain control of its maintenance. It is also where the airline can potentially aim to save money by monitoring the situation.

Maintenance Operations Control

Every operator needs to have control of events, especially if maintenance is unscheduled. A maintenance operations control department is responsible for overseeing the line maintenance activities and coordinating them with flight operations and the flight schedule.

For many operators, in particular the larger ones, it is important to keep maintenance operations in-house, since this is connected to the maintenance planning department. Furthermore, it is important that those making decisions about unscheduled maintenance are able to speak efficiently to the ground and operations staff about the plan of action, whether it is a flight delay or a change of aircraft.

Some airlines, such as BA or jetBlue, will look after their own maintenance operations control. Others will deal with it when an aircraft is at a homebase, but will use a third-party maintenance

Another aspect of maintenance management is maintenance operations control for dealing with AOG situations and non-routine on-wing maintenance. More airlines are willing to consider sub-contracting these activities to specialists.

provider to oversee any maintenance requirements while an aircraft is down route.

Turkish Technic offers a Maintenance Control Center for its customers, which is staffed by engineering, planning and quality staff 24 hours a day in order to monitor maintenance activities. It can then adapt and come up with new plans for customers if unscheduled maintenance occurs.

Maintenance Programme

In its simplest form, the maintenance programme follows the manufacturer's guidelines. As an operator's experience grows, however, it is able to change and adapt its maintenance programme to suit its operation. Many MRO facilities and aviation consultancies have gained experience from previous clients, and are able to assist new clients in designing a maintenance programme that suits them. Once the programme is up and running, the same MROs and consultants will be able to monitor the airline's aircraft and assist in planning maintenance downtime. The ideal situation is that the aircraft will all have maximum intervals between maintenance tasks, with as little downtime as possible. Maintenance events should also be staggered so that as few aircraft as possible are grounded at any one time. This is where collaboration between the third-party provider and an airline's planning department comes in.

Managing of ADs and SBs

Airworthiness Directives (ADs) and Service Bulletins (SBs) have to be addressed, so having an additional company to support an airline can be invaluable. Richardson explains that TES's EFPAC software assists with the management of ADs and SBs in engine maintenance.

EFPAC software knows exactly when a fleet's engines need ADs to be actioned, and where the engines are located. A reminder pops up on the screen. There are many software systems that are able to manage ADs and SBs as well other tasks. If an airline has the software, then it can easily manage the situation, but since these programmes can be expensive, it is often more cost-effective for an airline to outsource.



Managing life limited parts

MROs and consultancies have generally built up years of experience with life limited parts (LLPs) over hundreds of aircraft and engines. They are therefore in an ideal position to offer advice to new or small airlines about monitoring and maintaining LLPs, as with maintenance programme management.

Knowing how a certain part has performed in the past can allow an operator to judge more effectively when it should be removed or replaced, and integrate that timing into scheduled maintenance. This is where the MROs and consultancies come into their own: allowing operators to maximise an aircraft's utilisation, while minimising the downtime costs, such as unscheduled maintenance. Richardson says, for example, that where there is a choice of two equally suitable types of engine blade, TES would have the experience to know that one is more cost-effective than the other, and would have the data to prove it as a result of overseeing 100 or more engine shop visits each year.

LRU & logistics management

There is no doubt that aircraft and engine rotables are a massive investment for airlines. They need to have at least an inventory of parts that are regularly required on the line, with additional items that an experienced airline knows it will require on a regular basis. This system has to be in place so that mechanics can quickly access a rotatable item and get the aircraft flying again. In a best-case scenario, an aircraft can be

repaired in the same time that it has been scheduled for an airport turnaround. In the worst-case scenario, an aircraft-on-the-ground (AOG) situation, the part is not available and the aircraft remains out of action for days, while the part is sourced and dispatched to the aircraft's location.

There are many specialist rotables and logistics providers, as well as the larger MROs, that have large inventories at several global locations. They can provide assistance to airlines in the form of advice with, and/or provision of, initial inventory at a homebase. It could also extend as far as leasing a full inventory (based on the supplier's and airline's experiences of that aircraft) at the airline's base, smaller basic kits at outstations and logistics, and AOG assistance when larger or less frequently used parts are unexpectedly needed.

This is one area in particular that is not necessarily just for small and new airline operations. This area of the industry is increasing in popularity as airlines look to minimise costs. Airlines can sell their inventory to a relevant company, and then lease it back. This often means that a more specific and streamlined inventory is developed, with the added benefit that the airline makes money from selling the excess stock.

Line maintenance

Whether at its main base or down route, an airline will always need line maintenance support. This can initially be another lengthy and expensive set-up for which new or smaller airlines do not have the capital. An airline's main airframe maintenance provider MRO is ideally



within the route network, but is not necessarily at the airline's operating base. Local support will therefore be needed. It is often cheaper for an airline to use a local company (especially at its outstations), than to ask its main MRO provider to set up a line maintenance base at a new location. Larger airlines such as Virgin Atlantic and BA, which do much of their own line maintenance in-house, will often have their own staff based at outstations for line and unscheduled work. They still also use third-party providers in some locations, for several reasons, including: the location is unsuitable; local wages are lower; or an alliance partner airline already has a large maintenance set-up there, which is then reciprocated back in the UK.

Storm Aviation is a third-party maintenance company that specialises in operators that need line maintenance. Martin Longden, group managing director for Storm Aviation, says that with a couple of weeks' notice they can set up and be supporting an operator anywhere in the world. By its very nature line maintenance is driven by customer requirements, because it is needed at every airport that an operator flies to and from. If a company, such as Storm Aviation, has a number of clients in one location, then the cost benefit for the airline far outweighs the cost and hassle of setting up an in-house line maintenance base. Longden adds that if an airline wants to consider a fleet change

on certain routes, it makes sense to use an outsourcing company to manage the maintenance on an aircraft that may or may not become a permanent feature of the airline.

Lease acceptance & return

Every aircraft that is leased will be accepted in a certain condition and will then have to be returned to the lessor in a specified maintenance condition. This can represent a minefield for a small airline, and is something that consultants can assist with. By outsourcing this function, the airline will get its aircraft or engine brought up to the level that the lease company requires with little additional effort. If the maintenance programme management has also been outsourced from the start, then the maintenance provider should always have borne the return conditions in mind, so that the necessary maintenance is done accordingly. As Richardson says: "End-of-lease criteria have to be considered at the same time as normal maintenance. The standards need to be met but not exceeded, in order to avoid needless overcharging."

Engine management

Engine monitoring for performance, trend and maintenance planning is also an engineering management function that can be outsourced.

According to Richardson, engine

Maintenance management requires an efficient system for monitoring aircraft utilisation and engineering orders, and matching these with the aircraft's maintenance programme for the planning of airframe checks and production of job cards.

maintenance is the biggest cost driver on an aircraft, with 80% going on materials and 20% on labour. Therefore, materials need to be managed efficiently by moving items between the fleet and having pre-purchasing plans in place according to expectations. TES does this for many operators by encouraging their sub-contracted facilities to repair items rather than replace them with new. With such a large proportion of value being held in the engine, it is imperative that an operator gets the maintenance right.

TES's European client requires TES to ensure compliance with the manufacturer's and airline's engine maintenance programme at the MRO, so that the workscopes are followed cost-effectively in order to reduce shop visit costs. TES will have personnel visiting all its MRO contractors, ensuring that an operator's requirements are fulfilled, which is something that a small airline is unlikely to be able to afford to do.

Many of the previous aspects of maintenance management functions are relevant to engine management. Engines need to be monitored and their maintenance planned. It is one thing for an engine to be fixed on-wing, but another matter all together if the engine needs to be removed. An airline would need to think about the aircraft's downtime, and the logistics of getting the engine to a suitable engine shop. Although this is not a major part of TES's core business, Richardson says that they are able to lease a spare engine to a client airline while its engine is in the shop.

An MRO or consultancy is able to assist the airline in gathering the relevant engine data together and putting it with other factors such as ADs, part-expiry dates and routine maintenance. This enables a planned programme of scheduled staggered removals and greater visibility for an airline. This visibility is increased by maintenance software such as TES's EFPAC. Air New Zealand, for example, wanted to increase the visibility of its maintenance and integrate all the relevant data together. According to Richardson, Air New Zealand now has SAP talking to TES, and this visibility can be passed on to all facilities working on

Management of engine maintenance is a complex task. It requires potential on-wing intervals, LLP lives, potential replacement of engine parts, and the cost of shop visit workscopes to be considered together to achieve the lowest possible cost per engine flight hour. This requires a skilled team.

an airline's aircraft or engines.

While all engine work can be outsourced, it is wise to choose a facility that can perform all aspects in-house. This, says Richardson, means that turn times are controlled and fewer variables can go wrong. If an engine spends more time at a shop than planned, then spare engine lease costs will increase.

As Miles explains, "Engines can cost up to millions of US\$ to fix, and their maintenance needs are not necessarily as easy to forecast as those of airframes. Outsourcing the management functions of an engine's maintenance can therefore be like an insurance policy for the engine."

Small & start-up airlines

In order to set up a maintenance & engineering department an airline would need to invest in personnel, tools, facilities and possibly an inventory of spare parts. It would also need to recruit and train a large number of mechanics, and have additional staff for supervision and management. By outsourcing the maintenance & engineering department, airlines give themselves time to decide which parts of their aircraft maintenance they want to bring back in-house and manage themselves. Over time it may be that all aspects slowly get transferred in-house, or that it proves beneficial to leave certain aspects as outsourced. Whatever the decision, the division between in-house and outsourced work has to work for the individual airline.

In addition to the basic idea of outsourcing, an airline needs to be able to easily see the status of their aircraft and engines. Many MRO facilities and independent IT companies, such as Lufthansa Technik, TES and Swiss Amos, have successfully developed such programmes with varying specialities. These systems can be expensive for a start-up airline to buy and use. A more cost-effective technique would be to outsource maintenance to an MRO that uses similar software, and have access that way.

TES comments that it is often an advantage to airlines to outsource, since they know where they stand and costs are easier to budget for with fees spread evenly over each month. Also, unscheduled maintenance becomes less



likely (although it can never be totally eradicated), since an MRO's experience can help prevent these events. "Logistically, having maintenance done at an MRO within an airline's route network is not necessarily more expensive than doing it at its homebase," says Miles. "The flightcrew are already being paid for, downtime is already accounted for no matter where the maintenance is undertaken, and many of the other costs are fixed anyway."

But, say Miles and Lamzed, when considering a maintenance facility, it is always important to look at the value for money that they offer. A facility may charge a lower hourly rate, but it may take longer than the industry norm to do a job. An airline might therefore pay the same, if not more, for a job that takes longer, with the result that an aircraft or engine is out of revenue service.

Future

Lufthansa Technik provides many maintenance services for airlines and has facilities all over the world. It feels that while the idea of outsourcing is popular and useful for some operators, others prefer to keep their maintenance in-house, in order to avoid losing control of it. Lufthansa Technik therefore feels that the interest is constant, and that there is no real increase or decrease in demand

for the overall maintenance outsourcing market.

TES, on the other hand, is positive about the future. More and more airlines are looking to independent MROs and consultancies to streamline their engine maintenance, keep costs down and reduce surprises. With the popularity of low-cost airlines, outsourced maintenance has remained in demand, especially with the intricacies of engine management. TES is therefore optimistic that the market for outsourcing engine management will grow.

Both Lufthansa Technik's and TES's views are echoed by IBA. It also comments that the need for aircraft maintenance could reduce as aircraft become technically advanced and more time is left between maintenance events and shop visits. This is then balanced by more airlines seeing the advantages in outsourcing at least some of their engineering and maintenance management functions in order to reduce costs, manpower requirements, and hassle. Longden also comments that with the aviation industry looking at ways in which it can minimise costs, then outsourcing is an area that will continue to be considered. [AC](#)

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