

# MRO

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## Spinning around

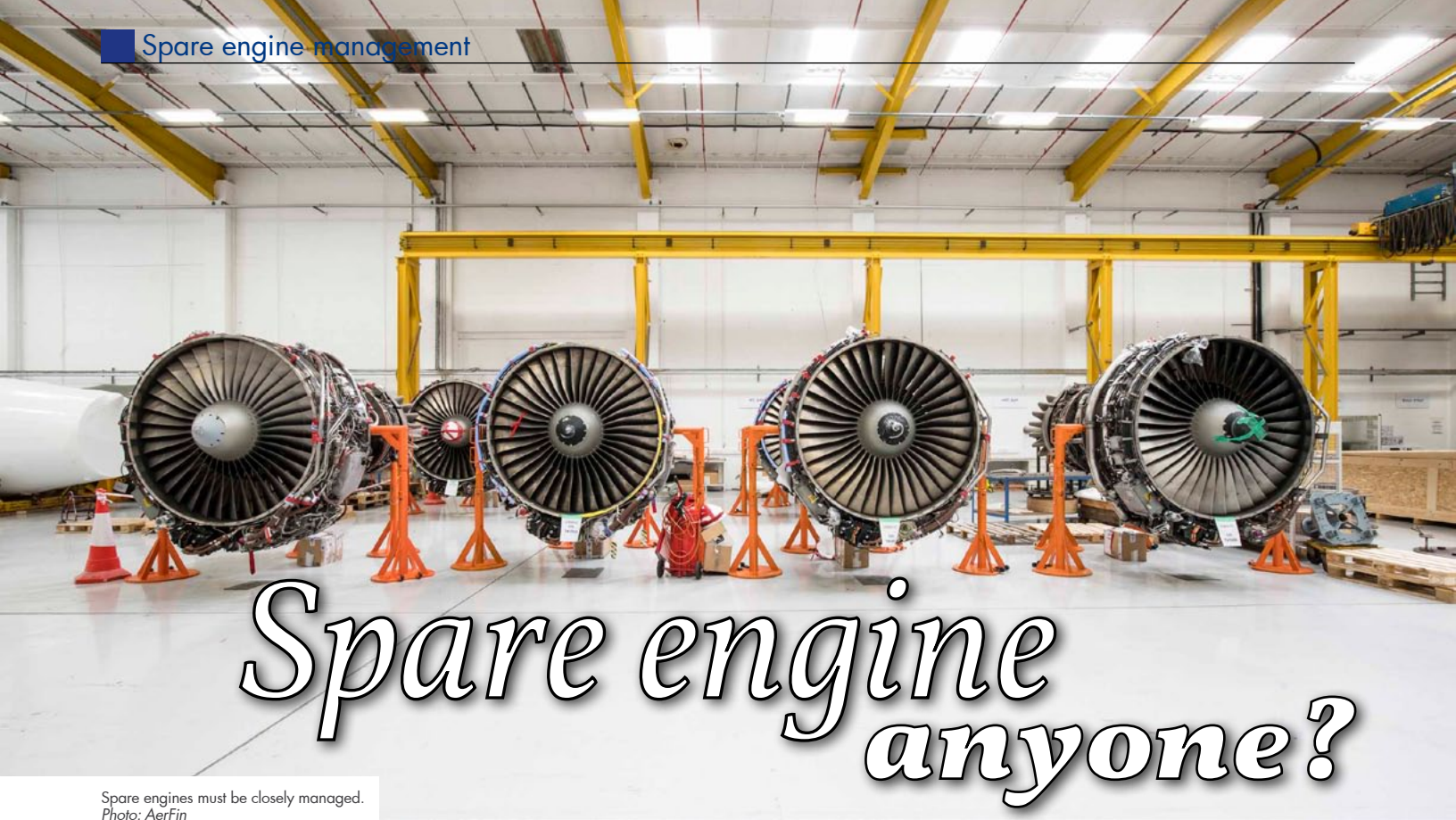
Managing spare engines

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# Spare engine anyone?

Spare engines must be closely managed.  
Photo: AerFin

Airlines have traditionally maintained their own inventory of spare engines or choose to avoid the capital expenditure by relying on engine lessors. **Keith Mwanalushi** examines the current market for spares engines.

**D**ue to the high capital value of aircraft, commercial airlines generally maintain spare engines to ensure aircraft are not grounded when engines are removed for normal maintenance, or for other reasons.

When compared to the airframe, engines require more intensive technical management and since engine overhauls are one of the largest airline operating cost segments, each overhaul must be closely managed.

Craig Welsh, SVP and Chief Commercial Officer, Americas and Asia at Willis Lease Finance Corporation says the key to optimising cost versus availability is carrying as few spare engines as possible on a full-time basis, and bringing in additional engines when and as needed, for example, to support a cycle of scheduled shop visits.

"All the engine OEMs have historically recommended a minimum level of full-time spare engines based on a simple spare to installed engine ratio," states Welsh.



Craig Welsh, SVP & CCO, Americas and Asia, Willis Lease Finance Corporation

He warns that this has proven to be a very expensive proposition as less than half of these engines are utilised at a rate that justifies their carrying costs from an investment standpoint, whether they be financed by debt or sale-leaseback, or even owned outright.

Willis Lease has a number of optimisation programmes such

as 'ConstantAccess' and 'ConstantThrust' which Welsh believes can save airlines millions by employing an on-demand availability principle that allows airlines to own only those spare engines required full-time by their operations (as opposed to by a contractual delivery schedule) while accessing the portfolio of over 300 assets for any remaining requirements.

"The underlying economics of these programmes are very compelling and are poised to drive significant savings across rapidly growing fleets."

Obviously, leasing engines is a popular choice for airlines and operators looking to release capital. Andrea Luebke, Managing Director at MTU Maintenance Lease Services says the spare engine ratio for in-production engines is proportionally lower as opposed to more mature engine types.

"Airlines used to have about 15% of spare engines of their installed engines. This figure is now down to 10% and, according to our estimations, will further decrease to about 7 or 8% for newer engine types. This comes along with a higher OEM coverage of the aftermarket, which typically includes spare engine support," Luebke tells.

Spare engine support is also included in MTU Maintenance's customised MRO solutions, such as PERFORMPlus, for newer engines, as well as SAVEPlus,



Andrea Luebke, Managing Director at MTU Maintenance Lease Services



Engines require more intensive technical management.  
Photo: S7 Technics

for mature engines. "Further, highly customised and expert fleet management, also provided as part of these services, can increase the availability of spares. We also can lease out idle spares on behalf of customers as part of our solution for asset owners."

Furthermore, Luebke explains that airlines can manage spare engines more efficiently through the many options on the spot market like the solutions offered by MTU Maintenance Lease Services B.V. "We provide short-term leasing, stand-by arrangements, engine pooling, as well as asset management. We plan to grow and develop with this market and continue investing in spare engines as well as innovating our product portfolio."

"Maximising aircraft and engine availability while minimising downtime is the main objective of any airline," mentions Abed Fakh, Technical Manager at Royal Aero. He sees a few factors that will need to be considered when optimising spare engine availability.

"An accurate prediction of the time on wing of engines is usually a great starting point."



Abed Fakh, Technical Manager at Royal Aero

He says this could be either the airline's specific data based on their operation, fleetwide data or using some of the robust prediction tools available on the market, such as the Royal Aero MIDAS-severity app. "This would allow the airline to predict how long their engines would last on wing. A set number of unscheduled events will also have to be factored in to give the fleet more protection."

The second aspect is the length of the maintenance cycle, in this case the shop visit Turn Around

Time (TAT) – "The number of shop visits and the total downtime should allow the airline to accurately forecast how many spare engines are required."

With the reliability of engines increasing through their life cycle, a good stagger programme is also another strategy which could be followed to optimise spares and cost. Fakh continues: "This is a strategy where airlines elect to remove some of their engines early and put them through the repair cycle, to avoid a period where they will require multiple engines in the shop at once, and hence minimise the number of spare engines required."

"Some small operators with leased aircraft tend to insert spare engine clauses as part of their lease, where the lessor is responsible for providing a leased spare during periods when the engine is in the shop."

It is anticipated that new aircraft types will drive the requirement for new spare engines. These new engines have greater predictive maintenance capability.

Kevin Poulin, Director, Customer Programmes StandardAero reckons the avoidance of certain MRO events using engine health-monitoring for predictive maintenance will inevitably have some impact on spare engine management, as will the continual improvement in time-on-wing associated with advanced engine materials and design.

"However, there will always be unscheduled engine removals caused by unpredictable events such as foreign object damage for instance, which will continue to drive spare engine requirements."



Kevin Poulin, Director, Customer Programs at StandardAero.



Mariano Longo Chief Business Officer, Aerojet

Likewise, Poulin adds engines sent in for service but found to be beyond economical repair (BER), for example due to operation in harsh environments, will also require that airlines have a reliable source of spare engines when required.

"Predictive maintenance will reduce downtime for new engines, but sudden issues and faults cannot be completely controlled, for instance bird strikes or weather issues," comments Mariano Longo Chief Business Officer, Aerojet Limited. Also, he cites hostile environments and pilot's performance that will have an impact on the life of the LLP of the engines.

Christopher Whiteside, President and CEO, AJW Group feels the market for new and high value engines is largely controlled by the OEMs who offer total care and flight hour agreements packages that provides airlines with additional comfort but is charged at a premium.

"We are seeing increasing numbers of airlines opting for this approach as it, in effect, transfers the full risk of engine maintenance to the service provider. The typical cover of a such total care packages includes guaranteed spare engine availability and provisioning for both scheduled and unscheduled engine removals," comments Whiteside.



Christopher Whiteside, President and CEO, AJW Group

Due to the rapid evolution of technologies in the aviation industry, particularly aircraft and engine technologies, the standard ratio estimated by lessors of one spare per 10 operational engines is broadening, observes Ahmed Zafar, Manager, Asset Management at ACC Aerotask.

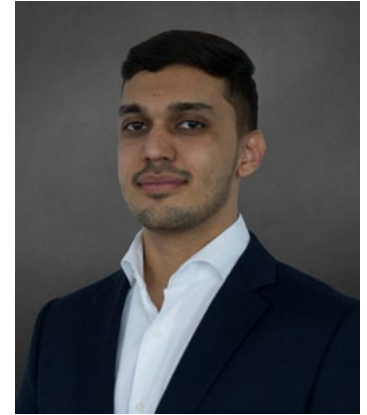
He says new engines being developed, such as the Rolls-Royce Trent XWB, offer greater reliability, leading to less frequent engine replacements. "The data provided by next-generation engine sensors will allow improved monitoring of in-flight engine

performance. Combined with better use of analytics, this will help to reduce the number of unplanned removals, thereby lowering the volume of spares required.

"The vast volumes of quantitative and qualitative data, combined with powerful analytics capabilities, will allow manufacturers to monitor and communicate precise forecasts of engine removals and enhance the reliability of their active engines to a level that will probably lessen spare engine coverage requirements over time," explains Zafar.

Anca Mihalache Vice President of Engine Trading at Apoc Aviation observes that the greater predictive maintenance capability of new engines may have a knock-on effect on the leasing market and the offer and demand of spare engines – "This will be further influenced by the spares market, MRO capability and slots booking. This does not mean that older engines will be retired in the short and medium term, merely that we will see two different trends in the market."

The volume of new aircraft to be delivered over the next few years is very significant and the "promised" reliability is improved over existing fleets, contributes Cliff Topham, SVP Sales and Business Development, Werner Aero. "However, many new programmes have significant infantile problems and the engines they are replacing are extremely reliable, therefore there will take a wait and see approach to see if the planned lower investment of spare engines is achieved," he states.



Ahmed Zafar, Manager, Asset Management at ACC Aerotask

Some in the industry feel competition in the spare engine leasing market is driving more innovative services [or the lack of].

Topham feels that undoubtedly, competition is driving enhancements in the marketplace and pushing OEMs to up their game. "Ultimately airlines seem to be driving to a usage and availability metric."

With the constant pressure to reduce costs, airlines are demanding more comprehensive solutions from their service providers, remarks Welsh from Willis Lease. "Engine leasing is no longer about who has the cheapest cost of money, but which providers are delivering the most value and driving cost savings through long-term programmes and innovative solutions."

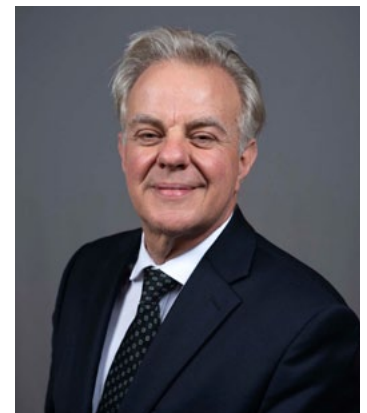
For example, Welsh states that the Willis Lease ConstantThrust programme couple's engine leasing with aircraft fleet retirement plans, to avoid expensive engine shop visits, saving airlines money as they transition into newer technology aircraft. "We offer a full platform of capabilities – including leasing, technical and asset management services, surplus material and custom programmes – to our customers, rather than only offering a financing product."

Nowadays, Longo has seen that competition in MRO is driving to a continuous improvement in the business (LEAN) as it has been in the automotive industry for many years. "Innovation is the main tool to become an MRO 4.0: Go digital, paperless, focus on FOD, ergonomics, tool traceability, new capabilities [work on several products/manufacturers], strong engineering support and so on."

"Healthy competition is good in any market, as it keeps services competitive," comments Luebke of MTU. "Innovation can take place in terms of digitisation; we have recently introduced systems to manage our own fleets for instance and this is part of our TAMS offering in order to extract the best value out of assets."

Luebke says this is particularly helpful for engines entering their final run, as different price structures such as flat rates are being increasingly used in the market, as opposed to classic pricing structures.

Luebke continues: "We always focus on customer needs and



Cliff Topham, SVP Sales and Business Development, Werner Aero



The engine lease market is buoyant.  
Photo: S7 Technics

try to predict and respond to them instantly. Say for instance a lease agreement of a mature engine is coming to an end. The asset owner might want to dispose of the asset from their portfolio through a sale, while the airline might still want to operate the aircraft. But the capital expenditure to acquire it and to maintain the engines through its remaining life might not be in their best interest. This is where MTU steps in. It acquires the engines from the current owner and leases them to the airline for the remaining green time. Furthermore, to allow the aircraft to fly for the duration of its economical service life, MTU can replace any unserviceable engines with serviceable engines from its pool as an alternative to MRO solutions."

When it comes to the supply and demand dynamics with older generation used spare engines, James Bennett, Director Sales and Marketing at AerFin points out that though each engine is different, there are two key factors influencing both supply and demand of older generation engines.

On the demand side he says operators expect a surfeit of 'green-time' engines on the market as has typically been experienced, however supply is impacted by on the one hand ongoing low fuel costs. Lower fuel costs = lower fares which makes legacy equipment more attractive.



James Bennett, Director Sales and Marketing, AerFin

"That's having a direct impact on availability of spare engines in the market."

Secondly, as he indicates, is the entry into service challenges of the newer engine/aircraft types – "Operators who were targeting delivery of new aircraft to

replace older have been hit with significant delays which has meant prolonged operation of the planned retired fleet, again impacting the availability of spare engines hitting the market.

"Whilst we would expect both of the above conditions to change in the medium to long term it will continue to have an impact on the short-term market opportunities for operators," Bennett notes.

Although each engine type has its unique features and should be considered a market with its own supply and demand dynamics, fuel price will have an impact on all used engines, mentions Zafar from Aero-task. He says the operation of old single-aisle aircraft by some of the operators make them capable of securing "green time" engines most of the time. "These engines are available at very low values and lessors are capable of offering these engines into the spot market at competitive short-term lease and utilisation rates."

He adds that should the oil price remains low; airlines may decide to retain some of its older-generation fleet in-service for a longer period. "This also means that the number of aircraft retiring for part-out will decrease, reducing the number of 'green time' engines entering the market."

StandardAero's Poulin concludes that for many older legacy aircraft, airframe values do not support the investment associated with zero time. "As a result, part-life engines are becoming more popular for owners of such aircraft."

Poulin argues that the cost advantages of part-life engines are driven by availability: "Where there is a ready supply of aircraft being retired and parted-out, part-life engines become an attractive option. However, if the pool of available engines is limited, owners may find themselves bidding up market prices for the few good-quality part-life powerplants available, which may in turn lead to operators parking their aircraft and switching to newer, more supportable platforms."