

Spare engines are required to cover scheduled and unscheduled maintenance. The options for acquiring spare engines include purchasing, leasing, pooling and power-by-the-hour support. The relative advantages and disadvantages of each method are assessed.

The options for acquiring spare engines

Acquiring spare engines is an important matter for airlines. Enough spare engines are required to cover all scheduled shop visit maintenance events and unscheduled engine removals.

In the past, airlines owned most of their spare engines. Increased competition and cost pressures have led to carriers taking increasingly different approaches. Various forms of engine leasing have grown in popularity. In addition, some maintenance agreements now include the provision of spare engines to cover maintenance shop visits.

The main options for acquiring spare engine inventories are examined here, and their advantages and disadvantages are considered from an airline's perspective.

Spare engine options

In today's market, the average ratio of spare engines to installed engines is 10%. This means that an airline needs 10 spare engines to support a fleet of 50 twin-engine aircraft.

The main options for airlines to source spare engines include an outright purchase, and short- and medium-/long-term leases. Other methods include a spare engine as an element of power-by-the-hour (PBH) maintenance agreements and total support packages, and pooling arrangements.

Owning spare engines

Airlines can buy new or used spare engines. New engines would be supplied by the original equipment manufacturer (OEM) as part of a larger aircraft order. Used engines may be acquired from the OEM or various aftermarket suppliers.

Owning a spare engine guarantees coverage when one is required. It removes

the risk of being unable to find a replacement and the associated costs of grounding an aircraft.

From a utilisation and maintenance perspective, owning a spare engine may offer more flexibility than leasing it. Leased engines will have maintenance return conditions attached that might influence engine usage during the lease term, or even dictate that the engine is returned fresh from a shop visit.

An owned engine would have no such restrictions, although airlines would need to consider any effect that their approach to maintenance might have on the asset's residual value.

The main disadvantage of buying spare engines is the cash impact. "Engines are getting expensive," points out Bobby Janagan, general manager at Rolls-Royce & Partners Finance (RRPF). "A new GE90 can cost as much as \$35 million. To buy an engine outright an airline needs access to sufficient funds, such as working capital bank loans or other sources of finance at a reasonable cost."

Although some first-tier airlines might be able to secure the necessary financing to purchase spare engines at reasonable cost, many are not in that position.

Owning a spare engine also means that the airline assumes full maintenance and residual value risk for that asset, associated with engine obsolescence. Engine residual values could be negatively impacted by regulatory changes or technological advances. Remarketing the engine when it is no longer required may not be a core expertise for the airline.

Leasing spare engines

Leasing is an alternative to buying spare engines for airlines that cannot raise the required funds at competitive costs, and are looking for smoother cashflows,

or do not wish to take on the residual value risk of owning an engine.

Airlines can lease new or used engines for narrowbodies and widebodies. Due to the larger customer base and lower capital cost there are more lessors with narrowbody engines in their portfolios.

Engine leases are available from both OEM-affiliated and independent lessor and maintenance, repair & overhaul (MRO) organisations.

The number of organisations offering engine leases has grown in recent years.

In the past aircraft leasing was more common than engine leasing. Investors were cautious about investing in engines, due to concerns about the technical management and security or title interest of such assets.

More recently investors have realised that they can make better returns from investments in engines, with smaller asset values, rather than aircraft. This is mainly because engines retain their residual value for longer than entire airframes.

A CFM56-7BE engine, which powers the 737NG fleet, is worth \$7.5 million in a half-life maintenance condition. It is estimated that this engine will still have a residual value of \$7.15 million in seven years.

One factor in engines retaining their residual value is that their maintenance value is regularly restored with the replacement of components during shop visits.

Different engine leases are available to airlines: an operating lease, sale and leaseback (SLB) and finance lease.

Operating lease

Operating leases are the most popular form of engine leasing and the most used method for obtaining spare engines. About 50% of spare engines are procured

on an operating lease basis.

The engine is leased to the airline by a lessor, usually in return for monthly lease rental payments. The engine is leased for a given period of time, or lease term.

At the end of the lease term the engine is returned to the lessor. Before the lease is agreed the lessor will stipulate certain lease-return conditions that the lessee will need to satisfy. These will set out the maintenance condition and status in which the engine should be returned at the end of the lease.

Some lessors may require an engine to be returned fresh from a shop visit. This could lead to excessive costs for the lessee, since a full engine refurbishment may not be required based on the level of utilisation during the lease term.

Alternatively minimum conditions to return the engine to its pre-lease state may be agreed. These could include: the engine's performance capability, exhaust gas temperature (EGT) margin, and remaining life on life-limited parts (LLPs). Airlines will pay maintenance reserves to the lessor, as well as lease rentals, to cover the cost of LLP replacement or a proportional share of the cost of shop visits as they come due. Ideally the share of maintenance costs paid by the lessee would be proportionate to its utilisation of the engine.

"An operating lease could be agreed on a short-, medium- or long-term basis," explains Lee Whitehurst, senior vice president of trading and leasing at TES Aviation Group. "At TES we classify a short-term operating lease as anything from 30 days to 12 months. A standard short-term lease is three to six months. A medium-term lease is one to four years, and a long-term lease is anything longer than four years."

For new engines and long-term leases, rental payments can be expressed as a percentage or lease rate factor of the engine's market value. For older engines and short-term leases, lease rates are calculated on a case-by-case basis and may be expressed in actual dollar amounts.

An airline may need to take an engine on a short-term operating lease to cover a shortage of spare engines during engine maintenance.

TES is an independent lessor that offers engines on short-term operating leases. "Historically short-term leases are offered on older engine assets that are beyond half-life condition," explains Whitehurst. "These engines are leased on a short-term basis to use up their remaining green time before being parted-out by the lessor."

Newer engines tend to be available on longer-term leases. There are fewer short-term leasing options for new engines outside of the OEMs. As engine types mature in their use in the market, their

values decrease and so more lessors are able to enter the market.

"The market is currently looking for short-term leasing where the lessor takes the mechanical or maintenance risk," says Chris Grey, partner at Aer Auster. "Airlines may take an engine for three to six months, and then extend the lease if necessary. There are more bespoke deals where airlines may pay a cyclical or hourly fee rather than a rental."

"For the same engine type, rental

payments for a short-term lease are typically higher than for medium- or long-term leases," says Whitehurst. "This is partly because the lessor accepts a greater level of maintenance risk with a short-term lease, and the cost of this risk is passed on to the airline.

"Airlines taking an engine on a short-term basis will not want to assume responsibility for an engine shop visit when that asset may have already been used by other carriers," adds Whitehurst.

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“The lessor will subsequently accept the risk, but charge maintenance reserves accordingly as part of the rental fee.”

Another factor in higher rental fees for short-term leases is that they require more administrative and logistical management than a long-term lease.

“It takes time and effort to set up the leases and get the engines back, plus the downtime in between leases,” says Whitehurst. “If you leased an engine out three times a year for three months at a time, you would want to charge more per month than for an engine on a five-year lease where very little management is required once it is on-wing.”

Rental amounts for short- and medium-term leases vary considerably by engine type. The fees are market-driven and based on supply and demand.

Lease rate factors for young engines on long-term lease are currently 0.65%-0.75% for narrowbodies and 0.75%-0.85% for widebodies. These lease rates will vary depending on the overall deal terms. Lessee creditworthiness, the length of the lease term and deal terms including the redelivery conditions, will all influence the lease rates.

For an airline, the obvious advantage of taking an engine on operating lease rather than buying a spare is that no up-front capital investment is required.

Janagan points out other advantages. “In an operating lease the residual value risk lies with the lessor, not the airline. The lessor knows how to remarket engines and the airline does not need to.”

An operating lease also has its advantages when considered against other forms of leasing. “An operating lease will have lower monthly lease rentals than a finance lease,” adds

Janagan.

Stephan Rihm, vice president engine lease services at MTU Maintenance, says that accounting is simpler with an operating lease than for an owned asset, or one taken on a finance lease. “The asset does not have to be included in the balance sheet and the corresponding debt liability does not have to be calculated or included either. The lease payments are operational expenses so they are fully tax-deductible.”

On the downside Rihm points out that a higher level of expenses are reported. “Businesses which enter operating leases record a lease expense for each period throughout the duration of the lease. These expenses appear on the company’s income statement. The income statement reports the revenues earned for the period, the expenses incurred and the net income for the period,” adds Rihm.

A potential disadvantage of a short-term operating lease is that an airline may be unable to guarantee availability of a spare engine when it is needed. This risk is minimised by taking a longer-term lease. In this scenario the engine can be used as a dedicated contingency spare in the same way as an owned asset. A potential downside of the long-term lease is that the airline accepts a greater level of maintenance risk.

The return conditions for an operating lease rather than an owned asset, could add restrictions to the airline’s use and maintenance of an engine.

There would be likely to be restrictions on the use of parts manufacturer approval (PMA) parts and designated engineering representative (DER) repairs.

One of the main drawbacks to purchasing a spare engine is the high capital cost involved. A new GE90 has a list price of up to \$35 million.

PMA parts are (usually) cheaper alternatives to those provided by OEMs, and are supplied by alternative manufacturers.

DER repairs are approved by aviation authorities, such as the European Aviation Safety Agency (EASA) and Federal Aviation Administration (FAA), but are not licensed by the relevant OEM. DER repairs will generally be of a similar quality to OEM licensed repairs, but DERs will not be listed in the engine shop visit manual.

Some airlines may not approve of PMA parts or DER repairs. This means that the use of PMA parts or DER modifications may limit an engine’s future market prospects and so reduce its residual value.

“Lease return conditions are designed so that the engine can be placed with a follow-on customer once it has finished the current lease,” explains Janagan. “Some terms may not be ideal for some airline’s operations, and any breach in the conditions can lead to potential financial compensation. It is therefore important to choose the right lessor and to ensure that return conditions are matched to the operation from day one.”

Sale & leaseback

In an SLB transaction a lessor buys a spare engine from an airline before leasing it back to the same operator (*see The economics of engine sale & leaseback transactions, Aircraft Commerce April/May 2014, page 6*). The lease segment of the transaction functions as an operating lease with the airline taking the engine for a fixed term in return for monthly lease rentals and maintenance reserve payments.

“SLB transactions are generally the best way for lessors to acquire engine assets,” says Whitehurst. “There are two main scenarios in which an airline may want an SLB. In the first instance an airline, with a modern fleet and new engines that it plans to operate on a long-term basis, may perform an SLB transaction to raise cash funds.

“In the second scenario an airline looking to phase out a mature fleet may decide to perform SLB transactions to maintain spares coverage while removing ageing assets from its inventory,” adds Whitehurst. “Large lessors such as OEM-affiliated organisations and large

independents are more likely to be involved in SLB transactions for new engines on long-term deals. Smaller independent lessors such as TES are most likely to be involved in shorter-term SLB transactions for airlines phasing out mature engines, although this is changing and we are open to more longer-term opportunities.”

In the first scenario where a new engine is sold and leased back to an airline on a long-term basis, typical lease terms are five to 10 years for a narrowbody engine, and eight to 12 years for a widebody engine. Lease rate factors are 0.65%-0.75% for narrowbody engines, and 0.75%-0.85% for widebody engines. These will vary according to factors such as the deal terms including the purchase price, lessee creditworthiness and the lease term.

In the second scenario where a mature engine is being phased out the lease term may be shorter. The rental amount will be determined by the specific engine type and its residual value risk.

As with an operating lease, the advantage of SLB is that it does not need an airline to source up-front capital. It is also a way for airlines to raise cash by divesting their spare engines to a lessor.

An SLB transaction can also improve an airline's balance sheet. “The sale of the engine can remove the debt associated

with it from the balance sheet,” says Rihm. “If the leaseback is a ‘true lease’, the operator will not have to account for the lease obligation as a debt on the respective balance sheet.”

An SLB transaction also shares the other advantages of an operating lease in that residual value risk passes to the lessor, and monthly lease rentals would be lower than those for a finance lease.

An airline obviously needs to own a spare engine before it can perform an SLB transaction. Some airlines may be offered a discount by the OEM when buying a new engine. They may then be able to sell the engine at a higher price to a lessor as part of an SLB transaction, and so realise a book profit on their initial investment.

In terms of drawbacks, spare engines involved in SLB transactions, like those on operating leases, may face restrictions imposed by lease return conditions. If the engine is leased back on a long-term basis the operator retains the maintenance risk.

Finance lease

Finance leases may take place for new or mature engines and are more likely to be offered by a financial institution or OEM-associated lessor.

Under a finance lease, an airline leases an engine for a given period in return for monthly lease rentals. Unlike an

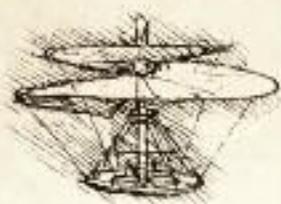
operating lease or SLB transaction, the airline assumes ownership of the engine asset at the end of the lease term.

Some form of maintenance reserve payment is usually still required so that the lessor is covered should the airline cease trading or default on its lease obligations, before it assumes ownership of the engine. These reserves would be paid back to the airline or offset against the amount owed for the engine at the end of the lease.

As with operating leases, the advantage of a finance lease is that, with the exception of a deposit, no up-front capital is needed to source a spare engine. It gives airlines the option to build an inventory of owned spare engines by spreading the capital cost over monthly lease rental payments, rather than requiring one large up-front payment.

“Finance leases recognise expenses sooner than equivalent operating leases and the lessee is allowed to claim depreciation each year on the asset,” says Rihm. “In addition, the interest expense component of the lease payment can also be deducted as an operational expense. At the same time, however, an increase in debt will be shown on the balance sheet.”

Janagan suggests that in comparison to an operating lease, a finance lease may provide fewer restrictions in terms of return conditions and engine



A. Man aspires.



B. Man constructs.



C. Man soars.

FIG. 1 Building on where we came from to help you move forward.

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maintenance. Since the airline will assume ownership at the end of the lease term, there may be more flexibility to use PMA parts or DER repairs. Despite this, some return conditions may still apply in the event that the airline ceases trading during the lease term and the lessor has to retain ownership of the asset.

Janagan points out the disadvantages of a finance lease over an operating lease. “With a finance lease the airline takes on the residual value risk. Monthly lease payments can also be up to three times more expensive for a finance lease, because the monthly payments for a finance lease need to finance the total cost of the engine over the lease term,” says Janagan. This is not the case in an operating lease where the asset cost can be recovered over multiple lease terms with different airline lessees and through potential sale or part-out. Airlines also take on the maintenance risk with a finance lease.

Which type of lease?

The type of lease an airline chooses depends on whether the engine is needed on an emergency or strategic basis. A short-term operating lease may be the best option for emergency spares coverage, while another engine undergoes maintenance. A strategic requirement may involve longer-term planning and consideration of all forms of leasing.

Other methods

Other methods for sourcing spare engines are through maintenance service packages, including PBH agreements and total care packages, pooling arrangements and standby arrangements.

Maintenance service packages & PBH

PBH support can be provided to airlines by engine OEMs, spare parts providers and MROs. With PBH support the airline pays a fee to guarantee the availability of a spare engine for short-term maintenance coverage when needed. PBH support is often linked to maintenance agreements.

To secure maintenance services, OEMs or other aftermarket suppliers may provide airlines with spare engines to cover maintenance events.

“Nearly all major engine MRO providers now offer spare engine support as part of the engine maintenance contract, or as an add-on service for the duration of the shop visit,” explains Rihm. “These are typically called ‘total care contracts’, and can be signed either with the OEM or an independent engine MRO service provider. MTU’s Total Engine Care (TEC) is one such example. With TEC, extra services like spare engine support can be combined with core engine MRO.

“Most all-encompassing contracts are calculated on a cost-per-flight hour (FH) basis, and the spare engine support is then included into the hourly rate,” adds Rihm. This is where the term PBH originates from.

“The rate for spare engine support can be calculated either on a FH basis, or as monthly fixed fee,” explains Rihm.

PBH or maintenance service package support should guarantee the provision of a spare engine when it is needed.

Airlines may also benefit from preferential spare engine coverage rates if MRO service providers offer competitive packages to encourage uptake of their total care maintenance contracts.

The most popular method of procuring spare engines today is by operating lease. This approach means airlines avoid high up-front capital expenditure and taking any residual value risk.

Rihm suggests that having a single-source service provider and point of contact for engine maintenance and spares coverage could also be beneficial.

A potential drawback of PBH support or maintenance package spares provision is that the spare engine could come with specific return conditions.

Pooling

“In an engine pooling scenario the operator’s spare engine requirement is covered by taking an engine pool membership for a given fee, usually a monthly instalment,” explains Rihm. “This gives the operator access to a pool of engines whenever needed.

“Upon engine rental, the operator pays for the engine at predefined membership prices and standard terms and conditions to ease lease handling,” continues Rihm. “Pool members can be either ‘consumers’ or ‘prosumers’.”

Rihm defines consumers as airlines that rent engines from a pool, but do not bring their own assets into that pool.

“Prosumers bring part or all of their assets into the pool for a dedicated period of time before renting them back if needed,” says Rihm. “At the same time these engines are temporarily available to other pool members if they are not needed by the prosumer. The deployment of engines among pool subscribers is based on joint shop visit planning, as well as a common confidence for AOG support. The engines are stored around the globe to secure fast access.”

Engine pools can be provided by OEMs, lessors and MROs. Alternatively engine pools can be formed by a group of airlines, usually fellow alliance members. In airline pools most members are likely to be prosumers. In OEM-, lessor- and MRO-run pools some or all of the engines may be provided by those organisations. It is also possible for prosumer airlines to put their own assets into such pools.

Rihm suggests that engine pooling can provide fast access to engines, since the assets are usually all around the world.

For consumer pooling arrangements Rihm highlights advantages, including the removal of risk in terms of residual value, under-utilisation and spare shortages. “It also means the operator has no asset

burden on the balance sheet,” he adds.

For prosumers, bringing their own engines into a pool can help generate additional revenues, by allowing an airline to increase asset utilisation by making it available to third parties.

A potential disadvantage of pooling is that some of the engines in the pool may not have the maintenance standard required by certain carriers.

For a prosumer, making their own spare engines available to third parties means they lose exclusive access to those assets. There could also be reduced flexibility in terms of maintenance and added administrative complexity, because the various pool members will need to agree on joint shop visit planning.

Stand-by arrangement

Stand-by arrangements can be used to cover AOG situations resulting from unscheduled shop visits and could be provided by OEMs, MROs and lessors. “The operator pays a monthly access fee for a specified confidence level and agrees up-front to standard lease terms and conditions in case of engine rental,” explains Rihm. The confidence level refers to the likely availability of a stand-by engine when it is required.

“A stand-by arrangement is cheaper and far more flexible than owning an

additional asset,” claims Rihm. “The access fee is scaleable and varies with fleet size, utilisation and the confidence level.”

Another benefit is that the airline does not take on the residual value risk of the asset.

A drawback is that a 100% stand-by confidence level is expensive. “The stand-by fee is often based on a lower availability percentage,” says Rihm. In this scenario, the engine lease provider will not guarantee the availability of a stand-by engine when it is needed.

Airlines also need to be aware of return conditions when taking a stand-by engine.

Current trends

Operating leases have become the most popular form of procuring spare engine inventory.

“In the past many first-tier carriers were state-backed, either explicitly or implicitly, and could fund all of the spare engines they needed from working capital,” explains Janagan. “Now, airlines are more cost- and cash-conscious and look for less capital-intensive methods for procuring spare engines.”

Among the operating lease options there is a trend towards shorter-term leasing, provided there is good market availability of the particular engine type.

“The current appetite is for short-, medium- and some long-term operating leases,” claims Whitehurst. “The shift towards short-term leasing is partly due to an increase in the number of engine lessors. There is now a greater supply of spare engines. If you can go into the market and source a spare engine when you need it there is no need to keep one on long-term lease just in case.”

The most suitable option

Whitehurst suggests there are four main considerations for airlines when deciding how to source spare engines: how much flexibility the airline requires in terms of utilisation, maintenance condition, and spares coverage; whether the airline wants to assume the maintenance and residual value risk or leave this to a lessor; how much money the airline wants to commit and when; and how an airline’s fleet plan will influence their spare engine procurement strategy. An operator looking to phase out a mature fleet will have different needs to one with modern aircraft that it plans to operate long-term. **AC**

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