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Uncertain times ahead

Engine lessors have struggled during the first 12 months of Covid-19, and uncertainty remains for the year ahead.

For the second year in a row, the aviation industry is in an unprecedented situation whereby airlines will have weaker summer season cash positions going into a further depressed winter season. As a result, there will be bankruptcies, and there should be concern on the impact a swathe of engines hitting the market will have on values on lease rates for the global fleet.

One engine lessor representative says his main worry is what critical point beyond which certain airlines may not survive.

"Last year, we were more optimistic. There was a developing process of developing a vaccine, but now, despite having the roll-out of those vaccines, people are more realistic and therefore more cautious," he says.

His concerns are the airlines which are still on the verge of bankruptcy and which are strongly dependent on the summer operations. If they can not come across the summer with fair amount of revenues, they will have difficulties surviving.

When Covid-19 hit the industry globally last year the consensus was that we could expect further Airbus A320neo/Boeing 737 Max order cancellations, which could have a positive impact on CFM56-5B/7B and V2500-A5 lease demand.

The cancellations have materialised especially on the Max side, and from aircraft lessors.

However, the demand for CFM56-5B/7B and V2500-A5 engines, in general, has been relatively weak over the past year, particularly affecting engine lessors.

Demand for leased engines are dependent on airlines' fleet structures and how operators balance them. The ongoing pandemic and its sudden impact on the aviation industry has clearly created some uncertainty among operators. Consequently, their focus has been on cash management.

Shop visits trend

The market has not improved over the past six months in terms of shop visits. Operators remain cautious because any shop visit, especially if they are not part of a power-by-the-hour agreement, would be a substantial investment. If airlines do not see any reasons for a shop visit, they will not commit to the investment.

But engine leasing and trading sources point out a trend that sees airlines avoid expensive shop visits. Airlines prefer to look for quick-turn repairs, which may fix some issues on the engine rather than commit to an extensive restoration of the engine.

These would allow the engine to be serviceable. As the engine is restored to serviceable conditions, airlines will run the engine for two to four months, maybe a maximum of one year. Under this strategy, operators are still able to utilise the serviceable engine for their fleet planning but at a lesser expense.

The immediate effect is a postponement of major engine performance restoration shop visits for late this year or for 2022.

"There is an element of uncertainty beyond the summer to commit $5-7 million for a full engine restoration," says one source.

"Everybody seems to be going down the road of MRO [maintenance, repair and overhaul] Lite," adds another lessor.

Some firms are pushing the MRO Lite model where they are offering module swaps, minor repairs, to get an engine to run down some greentime without having to perform heavy shop visits.

That trend is essentially on narrowbody aircraft, points out the source, but follows the turboprop maintenance model where an operator performs the bare minimum to eat life out of the engine.

"If you have an engine when there is 3,500 cycles life limited parts [LLPs] remaining and needs minor repairs, companies opt for just minor repairs work and run down the LLPs. You then can make the judgment on where the market is to reshop the engine," he says.

The pandemic has benefitted the engine original equipment manufacturers (OEMs) because they have had an opportunity to fix teething problems on certain engines without relying on the spare engine market. Also, the focus for some OEMs has been on shop visits for their latest spec engine variants only.

This again has affected lessors, especially those which have spare engines as part of their offering.

Spare engines provide support for installed engines in the event of routine or other engine maintenance or unscheduled removal. The number of spare engines needed to service any fleet is determined by different factors, including the number and type of aircraft in an aircraft operator's fleet, the time an engine is on-wing between removals, the average shop visit time and the number of spare engines an aircraft operator requires in order to ensure coverage for predicted and unscheduled removals.

Over the past 12 months, operators have rotated their engines because of cash constrains and therefore have turned less to engine lessors for support.

The market remains challenging for engine lessors.

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Julie Dickerson

Julie Dickerson
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Rolls-Royce targets year-end for ground-test UltraFan

Rolls-Royce officially started building the world's largest aero-engine, UltraFan, in the first quarter of 2021. This will help redefine sustainable air travel for decades to come, says the engine original equipment manufacturer.

Work on the first module is underway at Rolls-Royce's dedicated Demoworks facility in Derby, UK, and the demonstrator engine, which has a fan diameter of 140 inches, will be completed by the end of 2021.

The engine is the basis for a potential new family of UltraFan engines able to power both narrowbody and widebody aircraft and deliver a 25% fuel efficiency improvement compared with the first generation of Trent engine.

The engine manufacturer says the performance's improvement is crucial to achieving aviation sustainability. Gas turbines will continue to be the bedrock of long-haul aviation for many years, and UltraFan's efficiency will help improve the economics of an industry transition to more sustainable fuels, which are likely to be more expensive in the short term than traditional aircraft fuel.

The first test run of the engine will be conducted on 100% sustainable aviation fuel.

Significant investment has been made to develop the UltraFan demonstrator and associated technologies by Rolls-Royce and a variety of funding agencies, including the Aerospace Technology Institute and Innovate UK (United Kingdom), LuFo (Germany) and Clean Sky Joint Undertaking (European Union).

"This is an exciting moment for all of us at Rolls-Royce."

Chris Cholerton, Rolls-Royce, president, civil aerospace

"The UltraFan project is a perfect example of how we are working with industry to deliver green, sustainable flight for decades to come. Backed with significant government support, this project represents the scale of ambition for Britain's crucial aerospace sector," says the UK's business secretary, Kwasi Kwarteng.

"Companies like Rolls-Royce are playing a critical role as we build back greener from the pandemic and we are committed to giving the whole aerospace sector the support it needs to innovate and reach new heights."

Chris Cholerton, Rolls-Royce, president, civil aerospace, says: "This is an exciting moment for all of us at Rolls-Royce. Our first engine demonstrator, UF001, is now coming together and I'm really looking forward to seeing it built and ready for test. It is arriving at a time when the world is seeking ever more sustainable ways to travel in a post-Covid-19 world, and it makes me and all our team very proud to know we are part of the solution."

UltraFan is part of Rolls-Royce's Intelligent Engine vision – for example, each fan blade has a digital twin which stores real-life test data, allowing engineers to predict in-service performance. When on test at the Rolls-Royce's new £90 million ($125 million) testbed 80 facility, data can be taken from more than 10,000 parameters, detecting the tiniest of vibrations at a rate of up to 200,000 samples per second. Data that helps us understand our engines and further improve them.

Key engineering features of the engine include:

- a new, proven, Advance 3 core architecture, combined with Rolls-Royce's ALECSys lean burn combustion system, to deliver maximum fuel burn efficiency and low emissions;
- carbon titanium fan blades and a composite casing that reduce weight by up to 1,500lb per aircraft;
- advanced ceramic matrix composite components that operate more effectively in high-pressure turbine temperatures; and
- a geared design that delivers efficient power for the high-thrust, high bypass ratio engines of the future.

Rolls-Royce gets **additional UKEF loan**

Rolls-Royce (R-R) secured approvals in the first quarter of 2021 for an additional £1 billion ($1.4 billion) loan guaranteed from UK Export Finance (UKEF).

In August 2020, the engine original equipment manufacturer signed a five-year term loan facility, supported by an 80% guarantee from UKEF. The £2 billion facility was jointly led and backed by JP Morgan, Citi, HSBC and Credit Agricole-CIB.

Taking into account the maturity of borrowing facilities, the group had committed facilities of £10.5 billion at 31 December 2020. This was expected to drop down to £10.2 billion at the end of March 2021 as its Rolls-Royce £300 million Covid Corporate Financing Facility (CCFF) matures.

On 27 April 2020, the group issued commercial paper of £300 million to the CCFF, a fund operated by the Bank of England on behalf of HM Treasury. The borrowings were repayable on 17 March 2021 and held on the balance sheet at amortised cost.

Rolls-Royce has a 2.125% €750 million (£639 million) bond maturing in June 2021. As at 30 December 2020, €680 million remained current.

Another bond, totalling €550 million, matures in May 2024. The bond has a 0.875% interest rate and as at 30 December 2020, €511 million was undrawn.

Other outstanding bonds include: 3.625% $1 billion notes due 2025 (with $800 million undrawn); 3.375% £375 million notes due 2026; 4.625% €750 million notes due 2026; 5.75% $1 billion notes due 2027; 5.75% £545 million notes due 2027; and 1.625% €550 million notes due 2028.

Rolls-Royce had £9 billion liquidity at the end of 2020, including £3.5 billion in cash and £5.5 billion in undrawn committed debt.

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Rolls-Royce records charges of **£1.3bn**

Rolls-Royce recorded one-time charges of £1.3 billion ($1.8 billion) in 2020 including a £974 million from service agreement "catch-ups", mainly affecting its engine programmes, as a result of forecast reduction in flying-hour receipts.

The charges also included £213 million to cover up-front recognition of future losses, as a result of contracts becoming loss-making.

The powerplant manufacturer also took an £86 million charge reflecting "specific customer provisions" arising from the impact of the crisis and "customers' credit rating deterioration".

Rolls-Royce highlights the full-year impact of Covid-19 on the air transport sector by reporting a £2.6 billion underlying operating loss from its civil aerospace division. Revenues were down £3.02 billion over the 12-month period to £5.09 billion.

The manufacturer estimates the impact on its civil aerospace division at about £2.8 billion. This includes more than £2.2 billion impact on aftermarket services as a result of a 57% fall in widebody flying hours, reduced T&M and V2500 receipts.

The powerplant manufacturer says large engine flying-hour performance was "significantly more robust" for its newer engine programmes than its more mature ones, and there was an 11% fall in major service visits for large engines, particularly in the second half, because of the reduction in activity.

It expects large engine flying hours to remain 45% down on 2019 levels this year – although it sees a "strong second-half weighting" as the recovery speeds up – and 20% down in 2022.

But it envisions large engine deliveries to remain low, with 200 to 250 planned for this year, alongside 100 to 150 business aircraft engines.

Rolls-Royce delivered 264 new widebody engines during 2020, down from 510 engines in 2019.

The engine manufacturer says it has "sufficient liquidity headroom" even in a downside scenario, and before disposal proceeds. It closed the year with £9 billion liquidity, including £3.5 billion of cash.

A total of £7.3 billion additional liquidity was secured during 2020, including a £2 billion rights issue and £5.3 billion of new credit through bonds, bank loan facilities and commercial paper.

Rolls-Royce says the new raised debt is long-dated with limited maturities before 2025.

As of 31 December 2020, it had £5.5 billion in undrawn debt (£2.5 billion revolving credit facility, £2 billion five-year term loan facility partly backed by UK Export Finance and £1 billion syndicated loan facilities).

The near-term environment for Civil Aerospace remains highly uncertain, says Rolls-Royce.

"We continue to plan for a range of recovery scenarios, including the risk of further setbacks to the recovery in air travel caused by new strains of the Covid-19 virus. However, our central assumption is for a gradual market recovery in 2021, with a slow start to the year but accelerating in the second half as global vaccine roll-outs progress and travel restrictions ease," states the manufacturer.

Rolls-Royce anticipates large engine flying hours [EFH] of about 55% of 2019 levels in 2021 (2020: 43%), with a strong second-half weighting as the recovery accelerates, and about 80% of 2019 levels in 2022.

It adds: "Our severe but plausible downside scenario assumes approximately 45% EFH in 2021 and 70% in 2022, both compared to the 2019 level."

Safran sees appetite for first-rated bonds

Safran's dual-tranche bond offering has attracted strong demand from investors.

The French manufacturer launched a dual-tranche offering of unsecured bonds for a total of €1.4 billion ($1.65 billion) in April 2021. The bonds have five- and 10-year tenors.

Final terms were set as the orderbook amounted to €4.6 billion, representing more than three times the amount of the issue.

"The success of this transaction demonstrates investors' confidence in Safran's resilient business model and its capacity to overcome the impact of the Covid-19 pandemic on the aerospace industry," states the manufacturer.

The five-year tranche, which amounts to €700 million, received more than €2.25 billion of orders. Orders peaked at €2.4 billion. It was launched at between €600 million and €700 million, with an initial pricing talk at market swaps plus 85-90 basis points (bps). Guidance was market swaps plus 60-65 bps. The tranche was issued at 99.231% of its nominal value and has a coupon of 0.125% a year, for a 0.28% yield, says Safran.

The €700 million 10-year tranche saw demand peak at €2.3 billion. The tranche was issued at 99.349% of its nominal value with a 0.75% coupon, for a 0.818% yield. It launched with an initial pricing talk at market swaps plus 110-115bps with a guidance in the market swaps plus 85bps area.

Credit Industriel et Commercial and Societe Generale are the global coordinators of this offering and, together with SMBC Nikko Capital Markets Europe, Standard Chartered Bank, Santander Corporate & Investment Banking and MUFG Securities (Europe), acted as joint lead managers.

The transaction marks Safran's first issuance since the publication of its long-term rating by Standard & Poor's on 25 February (BBB+ with outlook stable).

With this offering, Safran reinforces its liquidity and lengthens the average maturity of its debt, and locks in historically low funding levels. The proceeds of this offering will be used for Safran's general corporate purposes.

The company previously issued two bonds: a €500 million unsecured bond in 2018 and €1 billion dual-tranche bond in 2017.

The €500 million unsecured bond had a coupon at 33bps above three-month Euribor. The maturity was July 2020.

One €500 million tranche of its 2017 unsecured bond matured in 2019, while the second tranche is due on 21 June 2021. The floating rate coupon is at 57bps above three-month Euribor.

The European Investment Bank (EIB) recently committed a €500 million credit line to Safran for research into new propulsion systems for narrowbody aircraft.

The credit line will be made available through September 2022, with the date to be chosen by Safran, with maturity 10 years from the date of the provision of the loan.

"The funding arrangement set up with the EIB will make a decisive contribution to Safran's research into carbon-free aviation," says Safran's chief financial officer, Bernard Delpit.

"The disruptive technologies developed by these projects should make a significant contribution to meeting our goal of carbon-neutrality," he adds. "At Safran, we are very pleased to have established a long-standing relationship with this institution, which has already helped finance several of our key projects."

The aerospace manufacturer noted the project has four main goals: maximising propulsion efficiency; optimising energy management; developing disruptive technologies; and integrating them into commercial aircraft with the aim of using only alternative fuel sources.

IBA forecasts positive trends for engine utilisation

The aircraft engine market is showing early signs of recovery from the worst effects of the Covid-19 pandemic, but is not set to return to pre-pandemic levels until the mid-2020s, according to advisory firm IBA.

Highlighting the acceleration of the vaccine rollout in certain markets, IBA forecasts a positive forward trend for late 2021 in engine utilisation. The firm expects the trend to focus initially on larger domestic markets until global vaccine uptake increases. Engine maintenance, repair and overhaul (MRO) demand will continue to lag behind as operators continue to offset maintenance expenses, says IBA.

The company sees engine flight hours plateauing at about 1.4 million a month, having plunged from about 2.8 million at the end of 2019 to fewer than 600,000 in April 2020.

Full-scope engine shop visits are down by 70% compared with pre-Covid levels and engine MRO revenue has fallen 50%. However, IBA is now seeing three-month lead times for some shop visits, indicating that engine MRO providers have restructured their operations to better match capacity to demand.

The firm believes this capacity restructuring may negatively impact the timeframe for recovery in engine shop visits. If engine MRO providers are able to build back capacity in line with increases in demand, shop visit levels could recover to pre-Covid levels by 2024. If they lag significantly behind demand, IBA forecasts a five-year recovery timeframe to 2026.

Between June 2020 and February 2021, IBA noted a uniform increase in the number of active engines and a decrease in those on aircraft parked or stored. However, it believes some of this activity is due to airlines opting to fly aircraft and their engines at very low utilisation rates rather than incur the building costs of long-term storage.

While engines for aircraft types such as the Airbus A350 (Trent XWB engine), Boeing 737 Max (LEAP-1B) and A320neo (PW1100G) are 100% in service, 51% of CFM56-3 engines, which power the 737 Classic, and 40% of PW4000-94 powerplants for the 747 and 767 are out of service.

"The aircraft engine market as a whole is now well established on the path to recovery, but specific factors such as the ability of MRO providers to build back capacity will significantly affect its timeframe," says Phil Seymour, president of IBA.

He adds: "As engines are returned to service, issues resulting from long storage and low utilisation are likely to arise, and the MRO community will need to work seamlessly with airlines and regulators to ensure these are addressed so that the pace of the recovery is not restricted."

The firm reports 168 LEAP-1B powerplants (powering 84 aircraft) entered service between November 2020 and March 2021, shifting significantly the dynamics of narrowbody aircraft engine utilisation.

While this engine type only represents 22% of new-generation narrowbody powerplants in service, that proportion is expected to increase sharply as the Max re-enters service at a greater scale.

IBA estimates the new-generation narrowbody engine backlog at 7,466 engines. The backlog for the newest widebody engines also remains substantial – in particular, for the GE9X (612 units), GEnx-1B (624), Trent 7000 (546) and the Trent XWB (1,008).

While the in-service status of current widebody engines is strong on many types, 44% of the 1,704 Trent 700 engines powering the A330, and more than 90% of the GP7200 and Trent 900s powering the A380, are either parked or stored. The delays to the 777X programme are also affecting this market segment by prolonging demand for the GE90 engine variants.

Regional aircraft are leading the recovery in many regions as airlines downgrade to these types from larger narrowbodies because of lower levels of demand, and they are also consistently being used on essential (public service obligation) services.

IBA says that between July 2020 and February 2021, the percentage of regional engines that were active increased to 64% from 44%.

Willis Lease creates new market for engine financing

Engine lessor Willis Lease Finance closed its first transaction in March 2021 featuring its new revolving credit lease (RCL) engine-financing product.

Launch customer Scandinavian Airlines System selected the RCL to finance CFM LEAP and Trent XWB engines, which power SAS's Airbus A320neo and A350 aircraft, respectively.

The engine lessor created the financing product to address a lack of financing options for new-technology engines, despite the pricing of certain engine types approaching the pricing of a whole aircraft. It marries certain attributes of a revolving loan with those of a traditional operating lease into one lease product with payment cash flows that mirror the way engines produce revenue for airlines.

Willis Lease says the RCL provides more liquidity, including for future maintenance, and more flexibility for airlines interested in long-term ownership of their engine assets.

"We are very excited to introduce the revolving credit lease and are thankful for the opportunity to grow our relationship with SAS," says Brian R Hole, Willis Lease's president. "The RCL creates a new market for engine financing and is proof once again that Willis Lease is the leading innovator in engine leasing, financing and management."

SAS vice-president fleet management, Niklas Hårdänge, says: "We are always looking for new ways to lower our costs and increase flexibility and we believe financing these engines with Willis Lease's new revolving credit lease helps us do both."

Lessor buys 24 **P&W engines**

Willis Lease Finance purchased 24 Pratt & Whitney PW1100G-JM and PW1500G GTF aircraft engines in December 2020. The transaction also includes a long-term maintenance and support agreement with Pratt & Whitney and an affiliate company, enabling Willis Lease to offer engines maintained to the highest-quality standard through Pratt & Whitney's GTF maintenance, repair and overhaul network.

"We have seen the trend continuing for airlines to demand engines on a 'just-in-time' basis. The bulk purchase of the GTF™ engines provides us the foundation for the scale required to deliver these engines through our ConstantAccess™ programmes," states Austin Willis, senior vice-president of corporate development at Willis Lease.

The engine lessor placed an order with CFM International for up to 60 LEAP engines in early 2020, representing the largest order in the company's almost 40-year history.

This includes both firm and option orders for LEAP-1A and LEAP-1B engines, which the company will use to support its customers operating Airbus A320neo and Boeing 737 Max aircraft. Those engines add to the eight LEAP engines currently owned.

LEAP engines reach 10m flight hours

CFM International's LEAP engine continues to set the industry standards as the fleet achieves one of the most rapid accumulation of hours and cycles in commercial aviation history.

The CFM International LEAP fleet has surpassed 10 million engine flight hours and five million flight cycles in less than five years of commercial service.

Since the first LEAP-powered flight entered commercial service in August 2016, the engine programme has grown exponentially, says the company 50-50 jointly owned by GE and Safran Aircraft Engines.

This engine has experienced the fastest order ramp up in commercial aviation history. As of early May, about 2,800 installed LEAP engines had been delivered to 136 operators worldwide.

"The LEAP engine just keeps delivering what we promised more than 10 years ago when we launched the programme. The rate at which the fleet has been accumulating hours and cycles is fantastic," says Gael Meheust, president and chief executive officer of CFM International.

"We're honoured to continue to reliably power our global operators' fleets, with a shared vision and ambition to create lower emissions and reduced noise to deliver the most efficient flight operations possible," he adds.

In late March, CFM International received a LEAP-1B engine order from Southwest Airlines to power 100 Boeing 737 Max 7 aircraft.

Southwest originally launched the LEAP-1B engine on the 737 Max in 2011 with an order for 150 firm aircraft. The new aircraft are scheduled to begin delivery in 2022.

"We are excited to take yet another monumental step forward in our long-standing partnership with Southwest Airlines," says Meheust.

"Furthermore," he adds, "this agreement shows the trust this airline has in our products, and it clearly demonstrates the collective confidence we continue to share in the Boeing Max aircraft and its bright future ahead."

In 1984, Southwest played a pivotal role in CFM's history by launching the CFM56-3 engine as the sole powerplant for what is now called the 737 Classic. In 1997, the airline launched the CFM56-7B as the sole powerplant on the 737 Next Generation.

The airline is now CFM's largest commercial customer, operating a fleet of more than 700 CFM-powered 737s.

"The LEAP engine just keeps delivering what we promised more than 10 years ago when we launched the programme."

Gael Meheust, president and chief executive officer, CFM International

GE90 engine celebrates 25 years' service

GE has delivered more than 2,800 engines; the propulsion pioneer has surpassed 100 million flight hours.

In November 2020, GE Aviation celebrated 25 years' service of the GE90 engine. Its inaugural flight was on a British Airways Boeing 777 between London and Dubai on 17 November 1995.

The GE90 engine has been among the most reliable in the industry, with a world-class dispatch reliability rate of 99.97%, says GE Aviation. Last July, the engine family surpassed 100 million flight hours.

"We continue to deliver these extremely reliable engines and our dedicated product support team will maintain the GE90 for many years to come, providing maximum value throughout its lifecycle," says Mike Kauffman, GE Aviation's GE90 programme general manager.

GE Aviation has delivered more than 2,800 GE90 -94B and upgraded -115B engines to 70 operators worldwide. The engine family powers all 777 models and is the exclusive powerplant on the 777-300ER, -200LR and 777F models.

The GE90 engine has been among the most reliable in the industry

The company says the GE90 engine faces some of the toughest demands daily on a high-thrust commercial jet engine. Despite this, it has achieved the lowest maintenance burden to date through service bulletin terminating action acceleration and analytics-based field programmes.

Its architecture and mechanical design have influenced every GE and CFM turbofan over the past 20 years, from the popular GEnx and record-selling CFM LEAP engine to the next-generation GE9X engine for the 777X.

The GE90 is the world's largest aircraft engine with a 123-inch diameter. It features the introduction of the dual annular combustion system and has the highest bypass ratio (9:1) and highest overall pressure ratio (40:1). The engine also included the first successful application of composite fan blades for a commercial turbofan engine.

It held the world record as the most powerful jet engine for 17 years at 127,900 pounds of thrust until the newly certified GE9X engine achieved the new mark of 134,300 pounds.

Willis returns to ABS market

Willis Lease Finance has launched its seventh securitisation, which will finance 29 engines and one Airbus A319 airframe.

A year after closing Willis Engine Structured Trust V, sponsor Willis Lease Finance launched a new asset-backed securitisation (ABS) transaction, in late April 2021, offering $336.7 million in aggregate principal amount of fixed-rate notes.

The three-tranche financing, which had yet to close at press time, included $278.6 million in an aggregate principal amount of series A notes, $38.7 million of series B notes and about $19.4 million of series C notes.

The A and B notes priced at a fixed coupon of 3.104% and 5.438%, respectively. Both tranches have an expected maturity of approximately eight years and a 6.9 years expected weighted average life. The C notes priced at 7.385%. The tranche features an expected maturity of approximately eight years, and an expected weighted average life of four years.

The initial loan-to-value (LTV) is similar to WEST V, the $366 million engine ABS that closed in March 2020. The series A notes have a 72% LTV while the B and C notes have 82% and 87% LTVs, respectively.

WEST VI is Willis Lease's seventh securitisation and like previous transactions, the engine lessor has retained the equity portion. BofA Securities and MUFG Securities Americas are structuring agents in the transaction. Bank of America is the liquidity provider.

KBRA rated the three-tranche transaction as A, BBB and BB, respectively.

Proceeds from the notes will be used to acquire 29 aircraft engines and one airframe, a 2006-vintage A319 leased to Easyjet through July 2022.

Portfolio

A total of 27 of those 30 assets are on lease to 10 lessees with three aircraft engines (10.5% by value) off-lease, for which no lease revenue was assumed throughout the transaction.

As of 31 March, the portfolio had a weighted average remaining lease term of about five years, excluding the three off-lease assets (one LEAP-1A, one LEAP-1B and a CFM56-7B) off-lease engines, or 4.4 years, excluding the off-lease assets, leases with a letter of intent but not executed and signed leases that have not been delivered.

This represented the longest lease term among the previous KBRA-rated Willis transactions. In addition, there are only two aircraft engines projected to come off lease in the next 12 months.

The portfolio has an initial value of about $387 million, based on the average of the half-life base values provided by three third-party appraisers, which were adjusted for maintenance conditions as of the first quarter of 2021.

KBRA noted that all of the engines in the portfolio are comprised of Phase I (77.1% by value) and Phase II (21.8% by value) engines that have stronger near-term re-leasing prospects, and it views such composition as a credit positive.

Engines considered Phase III could experience weaker re-leasing prospects than engines in an earlier stage of their lifecycle, which are typically designated as Phase I or Phase II.

The initial portfolio consists of a variety of engines that power narrowbody aircraft (79.3% by value), widebody aircraft (16.3% by value) and regional jet aircraft (3.4% by value), as well as the A319 airframe (1% by value).

The top three lessees comprise about 63.5% of the portfolio by value, and include SAS, IAE and Pratt & Whitney.

Structure

The transaction contains several components that have not featured in any KBRA-rated aviation ABS transactions, says the ratings agency. The features are credit-positive for the series A notes, it adds.

One such feature is a collections test. If on a single payment date rent collections are less than 75% of what is due, the amount of the scheduled principal due for the series B notes on that payment date will first pay down the series A notes and that same amount, if available, will pay down the series B notes from remaining cash.

There is also a minimum number of asset tests. If the issuer does not own at least eight assets, and the outstanding principal balance is lower than one-third of the initial allocable notional amount of all series multiplied by the associated scheduled series percentage, then the transaction will begin to use any excess cash to pay down series A notes and then the series B notes, sequentially.

This transaction also includes certain structural enhancements that are not included in most aviation ABS transactions, which KBRA views as a credit-positive.

One enhancement is a three-month debt-service coverage ratio (DSCR) test. The DSCR is calculated off a three-month lookback window of cash flows compared with other aviation ABS transactions that use a six-month window. The three-month calculation will both trigger and cure the DSCR test earlier than a six-month window.

There is also a security deposit account. This account will be funded with 100% of the cash security deposits associated with the initial leases that expire prior to the anticipated repayment date. Excess amounts on deposit will be used to cover shortfalls of senior expenses, principal, senior hedge payments and interest on the series A notes and series B notes and cannot be leaked to equity.

There is also a series C reserve account. WEST VI will feature a reserve account of $1 million, which will be used to cover shortfalls in interest and principal for the series C notes. In the event that the amount on deposit is less than $1 million, the series C reserve account will be replenished in the waterfall.

Proceeds from the notes will be used to acquire 29 aircraft engines and one A319 leased to Easyjet

Talking about the **new generation**

Airfinance Journal talks to **Roger Welaratne**, SMBC Aero Engine Lease managing director and chief executive officer, about the lessor's strategy.

SMBC Aero Engine Lease (SAEL) named Roger Welaratne as managing director and chief executive officer (CEO) effective 1 April, succeeding Akinori Kojima.

He joined SAEL in February 2020 as chief commercial officer after 14 years at GECAS Engines, where he finished as senior vice-president commercial.

Welaratne has 25 years' experience in aircraft engine leasing in leadership roles at GECAS and Shannon Engine Support.

***Airfinance Journal*: Where does SAEL see growth in the next few years?**

Roger Welaratne: SMBC Aero Engine Lease currently have a portfolio of 70 engines including managed engines. Our portfolio consists of LEAP-1A, LEAP-1B, PW1100, Genx-1B, CFM56-7B/5B, V2500, GE90-115 and CF34-10E engines. It is a fairly diverse portfolio and our customer base is also diversified.

Currently, the split is approximately 45-55 new-generation and current-generation engines. The growth is clearly on new-generation engines for us, with a view to get the new-generation content to over 50% of the portfolio by end of 2021.

What is the overall growth strategy for SAEL?

RW: SAEL's ambition is to grow further into a market-leading leasing company in the next few years with a focus on new-generation engines both narrowbody and widebody.

Investing in new-technology engines through building partnerships with our airline customers in their sustainability journey is fully in line with our shareholders' sustainable development growth commitment.

Our next tollgate is to hit the 100-engine mark. This will help us get to a critical mass and we will then be able to firmly establish SAEL in the leading engine lessor camp.

In 2020, during the Covid downturn, we grew our asset base by 60%. This was achieved whilst remaining focused, diligent and being selective on the asset type and the accounts we engaged with.

I believe SAEL came out a stronger company at the end of 2020 and we are poised to further capitalise on the opportunities the current environment presents us with. For 2021, our main focus will be looking at financing LEAP-1A, LEAP-1B, PW1100 and Genx-1B engines. We will also start looking into PW1500 and Trent XWB engine financing.

In addition to our organic growth, providing more investment opportunities to investors as trusted engine partner is another important growth strategy for us. We believe long-term engine leasing fits for purposes of several long-term investors around the world and, with our expertise managing credit and asset risk appropriately, we could offer more investment opportunities to the investors.

SAEL traded five engines last year but acquired 31 engines. Do you expect a similar level of activity in 2021?

RW: Indeed, SAEL is planning to grow at a similar pace in 2021 and keep that pace over the next years. As long as we can structure deals properly and comply with our deal underwriting process, we are happy to grow and take long-term asset risk.

We need to be diligent and we are not interested in chasing deals for the sake of growing. We are not interested in being over aggressive on our deals and structuring risky deals.

I think SAEL's mark on engine leasing will be its professionalism and its rigour, and that is the basis on which our shareholders are committing to this market.

I really hope some lessons have been learnt from some of the pre-Covid pandemic sale and leaseback deal structures. This does not mean higher returning deals but making sure different leasing risks are properly reflected and mitigated. Engine leasing is still a very strong business segment but it is a sector that requires expertise and specific skills to be successful.

Our goal is to establish a robust engine lease portfolio in terms of credit and asset risk management as well as economics which are attractive to our shareholders and potential investors with whom we will be cooperating in the future.

How can the relationship with SMBC help achieve the growth?

RW: The alignment with SMBC Aviation Capital and SMFL plays a key role and gives SAEL a solid financial foundation and a strong reputation. On 1 April, SMFL completed the 90% ownership of SAEL with a view of maximising synergies within the group.

Our board consists of directors from SMFL, MTU Aero Engines and SMBC Aviation Capital. The board is strongly encouraging close cooperation at the group level and looking for ambitious business strategies.

We benefit from the customer basis and the reach SMBC Aviation Capital has and we are already leveraging it. The market environment post-Covid will be very different and we will need to be more creative to remain a trusted engine partner for airlines, OEMs, MROs [maintenance, repair and overhaul companies] and investors. I believe SAEL is the best set-up to foster synergies among the group.

Will 2021 see an increase in shop visits?

RW: Unfortunately, I am not sure we will see an increase in 2021. We are hoping the pick-up is in the second half but I think we will definitely see it in 2022 for narrowbody engines. Currently, a large number of engine repairs are simply parked or deferred as all airlines are preserving cash.

Airlines can either park the entire aircraft or use an engine from a parked aircraft to keep operations. When the aircraft utilisation gets back to normal globally there will be a big surge in demand for spare engines to cover the currently parked shop visits and to put the parked aircraft back into service.

The widebody engine market will take longer to normalise and it is very hard to make any projections right now. However, I believe things will get clearer as soon people will be able to move and when we have some sort of path out of Covid-19. The pickup will be sudden as the whole industry is very resilient. We need to be ready when that happens.

Does the ownership structure change of SES (Aercap buying half the General Electric share) reshape the engine leasing market?

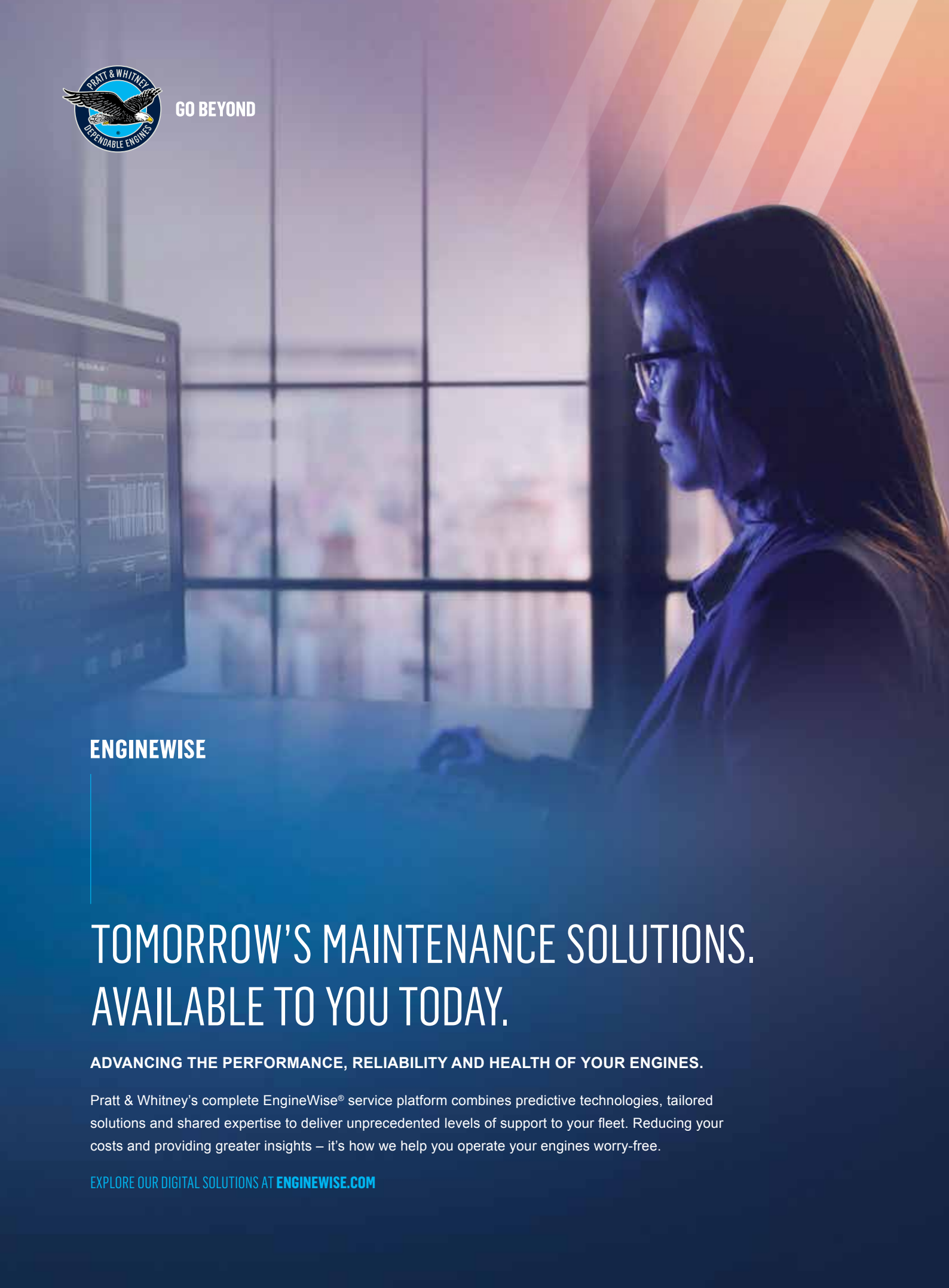
RW: Engine leasing is about 40 years old. It started as a niche and stayed a niche for perhaps the first 20 years before becoming dominated by the OEM or OEM-affiliated lessors. GECAS engine leasing has been and still is the largest engine lessor, so seeing GE exit engine leasing is a major event that will definitely shape the future.

It is too early to see how it will look given that we do not know much about how Aercap will play in this environment.

SES has developed a unique segment and is the largest CFM engine lessor. SES leads in what we would call the best segment, and it is very hard to beat the team that GECAS and SES put together.

The big question is to see what GE Aviation and CFM – and Safran – are going to do and how they will behave going forward. Both OEMs believe in an open MRO network and I am sure a lot of people would welcome an environment with less OEM influence.

Let us see how it plays out but SAEL would definitely like to play its part.



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LEAP engines maintain their dominance

The LEAP-1A tops this year's engine poll in what has been a challenging year for the sector.

The first quarter of 2021 was disappointing from an engine lessor's perspective as the anticipation that airlines will be more active in terms of capacity adjustment, balancing existing fleets, or even with new aircraft deliveries did not materialise.

One lessor's representative points out that airlines have been delaying capacity projections for the second and third quarter, and the challenge for every airline is how efficiently to shape to the right size in terms of capacity/fleet to release into the market.

"The moment airlines release more capacity in the market, in order to protect their market share, it exposes them to potential losses associated with flying. Load factors are more in the 40-60% bracket range, and adjusting (weak) capacity-utilisation is an issue for airlines to minimise exposure to low load factors, yields and revenues," says the lessor.

Flying a small fleet is also proving expensive despite the urgency to generate revenues. In this context, the spare engine topic is no longer a priority, he says.

This affects the leasing industry because airlines were also returning engines to lessors as part of their restructuring process. "We were taking back engines without a clear vision of where to put them next," adds the lessor.

Traditionally, the first quarter is active in terms of short-term leases because operators use the low utilisation of their fleet to put engines into the shop in preparation for busier periods in the year. This is in addition to traditional heavy maintenance visits as airlines work on capacity projections for the rest of the year.

The part-out business has had its challenges, because its business is related to the number of shop visits. Traditionally, this section of the market is driven by the demand for serviceable used materials from the maintenance, repair and overhaul (MRO) companies.

"Airlines don't want to put engines for full performance restoration shop visit, and demand for materials remains weak," says a source, who adds that, consequently, the part-out business is flooded with materials and literally very low demand.

"There is a lot of engine shop visit avoidance, deferral, engine exchange and/or a reduction in maintenance costs through higher use of USM and reduced workscope," says one source.

"Given all the uncertainty and focus on the nearer-term, many airlines prefer 'shorter-build' engines, as in used life limited parts (LLP) with 10,000 cycles remaining (corresponding to approximately 5-6 years of life) instead of brand-new with 20-25,000 cycles as there is no guarantee the aircraft will fly that long. Demand for green-time leasing should be on the rise."

One engine leasing participant admits his main worry is what is the critical point beyond which a certain airline may not survive.

"My concerns are on those airlines that are still on the verge of bankruptcy and who are strongly dependent on the summer operations. If they cannot come across the summer with fair amount of revenues, they will have difficulties surviving," he says.

He explains: "Last year, we were more optimistic. There was a developing process of developing a vaccine, but now, despite having the roll-out of those vaccines, people are more realistic and therefore more pessimistic for the short-term future of flying."

For him, last-minute ticket purchases require airlines to be very flexible in terms of capacity, and an aircraft such as the Airbus A319 market gives airlines more flexibility to get the right balance in terms of available seat miles and load factors.

Higher activity in sale and leasebacks

Some airlines have been more proactive to generate liquidity, through sale and leasebacks, compared with a year ago.

"We see lot of demand on the engine sale and leaseback market, with an aggressive approach from customers that realise the necessity to raise funds for operations. That appetite for engine sale and leaseback was not observed to that extent in the first half of last year, as airlines were cautious and had no strategies as to which asset to sell or store," he says.

In January, there was not much appetite for sale and leaseback transactions but February and especially March were the tipping point for that market, he says.

"We now see demand for sale and leasebacks on the LEAP-1B engine that was not there in the past, especially over the past 18-24 months. The momentum is there now, and it is encouraging for airlines and investors," he adds.

Narrowbody aircraft

	Investor appeal (out of 7)	Remarketing potential (out of 7)	Residual value (out of 7)
BR715 (717)	1.38	1.50	1.25
CFM56-3C (737 Classic)	2.07	2.17	1.73
CFM56-5A (A320 family)	2.07	2.20	1.97
CFM56-5B (A320 family)	4.73	4.23	4.80
CFM56-7B (737NG)	5.07	4.37	4.73
CFM LEAP-1A (A320neo family)	6.30	5.52	5.74
CFM LEAP-1B (737 Max family)	6.00	5.11	5.41
IAE V2500-A1 (A320 family)	1.57	1.57	1.57
IAE V2500-A5 (A320 family)	4.27	4.10	4.37
PW2000 (757s)	2.41	2.52	2.22
PW1100G (A320neo family)	5.93	5.15	5.63
PW1500G (A220 family)	4.48	4.19	4.63
RB211-535 (757s)	2.27	2.47	2.10

Source: Airfinance Journal, April 2021

"We now see demand for sale and leasebacks on the LEAP-1B engine that was not there in the past, especially over the past 18-24 months."

Some lessors may keep focusing on mature engines that power current-generation aircraft.

"It depends on the type of portfolio objectives but, overall, lessors are looking at increasing their market share in new engine types. They can be a strategic play by investing, as lessors, into new types of engines as part of a package that includes current engine models like the -5B and -7B," he says.

The -5B and -7B engines remain prime candidates for a recovery, although both variants are a notch down on last year's scores. Both benefit from a strong investor appeal despite a relatively high supply at the moment.

In the -7B market, there is a consensus that more than 50% of those engines have never reached a shop visit.

"There is a chance that if the aircraft manufacturer doesn't want to take the risk to push for production rates too high, airlines may see the opportunities to fill the gap in capacity by taking those [Boeing] 737-700s that are exiting the Southwest Airlines fleet," says one participant in the engine poll.

He adds that there might be a potential for more full performance restoration shop visits whereby the MRO will be demanding used materials, because the only way to optimise the cost of the shop visit is to use used serviceable material.

The -5B engine model maintained second place in the narrowbody mature market. Its scores and its popularity are still growing: 4.73 for investor appeal, 4.23 for remarketing potential and 4.75 for residual value. However, those scores are well down on the pre-pandemic totals.

"There is still demand for this engine as some operators and lessors have delayed Neo and the Max orderbooks," observes one participant.

"The -5B still remains popular as an engine to acquire for lease pools despite some lessors focusing on new-technology engines," comments another.

The V2500-A5 is expected to exhibit higher mature shop visit costs than the -5B and we should expect to see a more defined trend towards shop visit avoidance strategies among operators, driving lease demand.

It is also worth pointing out the V2500-A5 has the larger market share of the two engine variants on the A321, which is widely anticipated to have strong operator demand in a post-pandemic climate.

While not affecting the breadth of the fleet that was impacted by previous airworthiness directives (AD), the recent AD on the high-pressure turbine 1 disk will drive some engine removals and resultant lease demand, says a trading source.

The pre-pandemic period showed a trend of continued resurgence of mature narrowbody engines. The pandemic has seen a limited market beyond the -5B, -7B and V2500-A5 engines – beside the new-technology engines. And most agree that the -3C market is almost dead. The engine scored 2.07 out of seven for investor appeal, 2.17 for remarketing potential and 1.73 for residual values.

At the other end of the spectrum, the LEAP-1A is the best engine for investor appeal, remarketing potential and for residual values.

The LEAP-1A scored 6.3 out of seven for investor appeal, 5.52 for remarketing potential and 5.74 for residual values, although those scores were lower than the previous year.

Once again, CFM products led the engine poll in the narrowbody sector. The LEAP-1B probably benefitted from the 737 Max family recertification in various jurisdictions and re-entry into service.

Like the LEAP-1A, the PW1100G scored slightly less than in 2020, but as Pratt & Whitney has continued to solve the engine's technical problems, acceptance is reflected in the scoring.

Illiquid markets

The worst-performing engines in the poll are those for the aircraft in the most illiquid markets.

For example, the Trent 900, which powers the A380, performed the worst in the widebody market, scoring very low in all three categories.

The Rolls-Royce BR715 engine, on the other hand, has no prospects of recovery, especially after Volotea Airlines decision to release its remaining Boeing 717s.

Widebody aircraft

	Investor appeal (out of 7)	**Remarketing potential** (out of 7)	**Residual value** (out of 7)
CFM56-5C (A340-300)	1.19	1.22	1.30
CF6-80C2 (747s, 767s)	2.85	3.15	2.81
GE90 (777s)	3.27	2.43	3.00
GEnX (787s, 747-8s)	5.15	4.26	4.93
GP7200 (A380)	1.04	0.93	1.00
JT9D (747s, 767s)	1.07	0.97	1.07
PW4000 (A330s, 747s, 767s, 777s)	2.50	2.80	2.50
RB211-524 (767s, 747s)	1.48	1.48	1.30
Trent 553/556 (A340-500/600)	0.87	0.87	0.90
Trent 700 (A330s)	2.50	2.33	2.13
Trent 800 (777s)	1.52	1.52	1.52
Trent 900 (A380)	0.81	0.81	0.92
Trent 1000 (787s)	3.22	3.44	3.22
Trent 7000 (A330neo)	3.56	3.22	3.22
Trent XWB (A350s)	4.96	3.74	4.41

Source: Airfinance Journal, April 2021

"Both [GEnx and the Trent XWB] are viewed as long-term winners in the widebody space. The GEnx remains the best performer of the two engines but the Trent XWB is narrowing the gap."

One participant points out that the days are over for the -5A and -A1 engine types. "The market is gone for good," he says. While the prospects for the RB211-535 engine.

"There is little appeal to mainstream investors. But niche players continue to make good returns on these engines and the declining quality of spare engines and parts available," he adds.

Widebody troubles

The widebody market has traditionally lagged behind narrowbodies; just like aircraft investors, engine investors are typically less attracted to this market.

With a smaller installed base and a less-liquid market, the twin-aisle sector is seen as a riskier space in which to operate. There has always been a view that by taking more steps to address investor

concerns about the aftermarket, original equipment manufacturers could do more to make twin-aisle engines a more attractive investment.

Widebody engines have typically scored less than those that power single-aisle aircraft, and the pandemic has accelerated investors' views of this market, with the exception of the GEnx and Trent XWB engines. Both are viewed as long-term winners in the widebody space.

The GEnx remains the best performer of the two engines but the Trent XWB is narrowing the gap. It scored 4.96 in investor appeal (versus 4.22 last year), 3.74 in remarketing potential (3.5 last year) and 4.41 in terms of residual values (4.22 last year).

Powerplants on four-engine aircraft such as the A340, 747 and A380 fleets, in particular, have done badly, reflecting investor concerns about remarketing potential and residual value on those aircraft types.

Sentiments are divided on the GE90 engine.

One financier agrees there is aircraft oversupply, which will keep the spare engine market soft for the foreseeable future. Long-term post-recovery, it is expected to retain its place in the widebody market.

Another participant points out the start of the 777-300ER freighter conversions at the end of 2022 and the reasonable appetite for them. But he also indicates the continuing trend for retirements. Still, the 777-300ER model benefits from a relatively large installed base.

There is a positive market sentiment towards the Trent 700 engine but A330neo market penetration remains to be seen and will ultimately determine the engine's desirability, observes one participant.

Regionals

Demand has picked up for CF34-10 engines, says one source, but the market is limited to few players.

The CF34-8C market has been more active. There has been a fair amount of activity in the CRJ700 second-hand market with US carrier Skywest Airlines acquiring subfleets over the past year.

The Utah-based carrier acquired 10 CRJ700s from Go Jet Airlines last year, along with 11 units from Air France's Hop subsidiary.

The biggest drive in the CRJ700 market has been the engine condition. "Shop visit costs can run well in excess of $1 million depending on the level of high-pressure turbine work involved, as that's where the big exposure is at the moment," says a trading source.

Some aircraft have been offered at less than $850,000 while others are in the $3 million to $5 million range.

Regional aircraft

	Investor appeal (out of 7)	**Remarketing potential** (out of 7)	**Residual value** (out of 7)
CF34-8C (CRJs)	3.10	3.27	2.67
CF34-8E (E170/175)	3.67	3.60	3.03
CF34-10E (E190/195)	3.33	3.09	2.85
PW123 (Dash 8)	2.90	3.38	3.00
PW127E (ATR42-500)	3.48	3.95	3.52
PW127F (ATR72-500)	3.76	4.10	4.10
PW127M (ATR72-600)	4.19	4.33	4.14
PW150A (Q400)	3.24	3.38	3.19
PW1919 (E190/195-E2)	3.81	3.10	3.52

Source: Airfinance Journal, April 2021

"CF34 shop visit costs can run well in excess of $1 million depending on the level of high-pressure turbine work involved, as that's where the big exposure is at the moment."

The CF34-8C market has been the most stable and arguably the best-performing engine throughout the downturn. "The utilisation of the large CRJ fleets has been OK mainly because US operators have been flying the type through the pandemic," says one source. The E-jets have also been used in Europe as main European carriers have parked narrowdoby aircraft.

There are also some positive signs in the Embraer 190 market because the aircraft has been the most traded type over the past 15 months.

The PW150A market has been relatively quiet, but demand for the type has started to recover, as recently seen with the former Flybe aircraft transitioning to Canada. The PW150A is expensive to be put through the shop at $1.5 million to $1.6 million, and sources indicate that Pratt & Whitney has been impacted by the Flybe total care package.

The PW127M ranked first in the regional category with the PW127F engine lagging just behind. One trading source observes that lots of ATR72-500s have been parked or stored over the past year with engines not necessarily looked after. He reckons this market will see more retirements with the engine part-out activity coming along.

"As time goes," he adds, "there will be a bigger differential between the PW127M and the PW127F engine."

Covid-19 crisis effect on ELF strategies

The independent spare engine financing leasing company has been through many cycles, good and bad. President and chief executive officer **Tom Barrett** says the lessor's sound business strategy will see it, and its customers, through the pandemic.

Though the word "cyclical" is used to describe the aviation industry, it is important to acknowledge that all things in life as well as in business are cyclical. It is just the timing and causes of the cycles and their peaks and troughs that vary.

This Covid-19 crisis has affected everyone across the world in their personal life, work life and broader community life. While some regions are still struggling, right now there is hope that globally we are moving towards a recovery phase in this cycle.

The challenge to us in the industry is for experienced managers and their teams to use their skills to recognise what is happening, adapt to the changed reality and execute revised strategies that reflect the constantly changing circumstances presented.

If they do this right, they can continue to deliver successfully the required services to their customers, provide decent commercial returns for their shareholders and ensure their teams are energised and challenged as they navigate these circumstances.

The 2019 peak had passed

As someone who has been around this industry for 30 years, and has been through four or five cycles, there is no doubt that the Covid-19 crisis has been the most severe I have experienced.

In 2018, at a time when stored aircraft was running at 2,000, ELF, like many, was predicting the cycle was reaching its peak and suggested (provocatively, we thought) that parked aircraft might reach 5,000 when the industry turned. We had expected this to be a gradual decline ("soft landing") and in our wildest forecasts did not predict that it could be anything like the 10,000 figure we see today.

Had any forecaster then predicted, and been believed, such a radical increase in parked aircraft would have prompted many investors in the industry to cease their investment strategies immediately. They would have been right.

During this crisis, ELF has had to ask itself repeatedly, what is happening? We have debated what will happen to our customers, our own ability to deliver to them and continuously to evaluate the situation of our competitors. Everything has been up for grabs and every historic assumption that has served us well for 30 years about the engine leasing business has been taken apart and dissected.

The good news and the thing that keeps us so positive for the future of the company, and our industry sector, is that when we looked at our assumptions, we were able, even in the depths of the crisis, to be confident that the strategic pillars of this business remain sound.

Play to your strengths of customer relationship and asset focus

It all starts (always does) with the customer relationship and, in our case, this means customers which are predominantly airlines spread throughout the world. They have all been badly affected by the Covid-19 crisis and, unlike with previous cycles, it has been a truly global crisis. Any regional variations that have been apparent are more a result of the extent, or lack, of government support to the industry and the timing of the various waves of the pandemic.

Along with our customers, it has been impossible to plan the future with any degree of certainty.

Some of our longest standing, 30 years and counting, customers have been with us through previous cycles, and they know the long-term view and support they will get from ELF.

It has been even more crucial through the Covid-19 crisis that we engaged, listened and tried, wherever possible, to reach compromises that allowed us to maintain our business and our business relationships.

It is a source of considerable pride to our company that we delivered on every mandate, awarded pre-Covid, amid the crisis and none of our customers which engaged have found us wanting in our attempts to address their needs fairly.

In providing services and support to our customers, we continue to retain our asset investment focus. We are not a bank or investment fund. We are an asset owner and manager. With the support of our investment-grade parent, Mitsubishi HC Capital, we invest in aircraft engines for the very long term. Our customers for an individual engine may change but our strong asset emphasis remains.

We start by providing our sale and leaseback customers with good pricing on the acquisition of their assets and access to our exceptionally low cost of funds by then delivering lease rates that remain among the lowest available in our market.

> *“It is our long-term investment horizon and relatively low cost of funds that allows us to provide the customer with the economics they need.”*

It is our long-term investment horizon and relatively low cost of funds that allows us to provide the customer with the economics they need – ie, funding or even profit opportunity at the point of conducting a sale and leaseback and thereafter highly competitive lease rates.

Adapting placement strategy to new realities

The 2021 realities are that the engine market has switched from a period of undersupply to oversupply within a very quick timeframe. These new realities include uncertainty around early aircraft retirements creating increasing greentime engine supply, prolonged shop visit avoidance strategies, lack of utilisation of existing assets supplied and a recovery that will, in the near term, hinge on government management of the inoculation roll-out and cross-border travel policies.

Without question, ELF has been forced to adapt to these new realities to ensure that we maximise how we work with customers to get engines placed into operation.

Fortunately, we have been here before and having established a short-term remarketing team in a previous downturn, we can say with certainty that in terms of speed of response to our customer demands and positive engagement on negotiation, there is nothing that our team has not seen before.

It is because of the diversity of our portfolio and individual engine profiles within each engine variant that we can say to every customer, whether looking for access to a newer engine for the long term or cover for a limited shop visit or even some greentime to match their shop visit avoidance strategies, that ELF will have the engine that meets their specific requirements.

The strength of ELF’s financial resources and aggressive management of the asset carrying values also allows ELF to compete aggressively when it comes to lease rates in this market segment.

What is new in this cycle is the adoption by airlines, mostly those in bankruptcy, of a power-by-the-hour (PBH) model for leasing. This has been a new development and, although it is not in the lessor’s interests, or the long-term interests of the industry, it clearly is necessary for some airlines to ensure they can survive in the shorter term. In this area, too, ELF has been capable of selecting specific engines that can match the airline’s requirements.

However, when people ask whether this is the new model for engine leasing, ELF is confident that we are right that this is a model suited and sustainable in a period of oversupply. When the supply and demand re-balance, as they will for sure, then these PBH arrangements will no longer be possible or if offered, as some would have seen before, they will reflect exorbitant short-term lease rates.

For this reason, it remains ELF’s conviction that airlines, which are required to plan in multiyear cycles, are best served by managing the cost of spare engine procurement through the combination of long-, medium- and some short-term arrangements. When doing so, they will be able to rely on ELF to provide the most competitive long-, medium- and short-term rates reflecting the then market realities.

Along with pressure on our airline customers, we have seen our maintenance, repair and overhaul (MRO) customers (both independents and airline owned) suffer through this crisis. All of them have suffered the same dramatic drop in demand and, along with airlines, they have had to throw out long-term forecasting in favour of narrow crisis-focused strategies.

In this area, too, ELF has had to adapt, and one positive side effect of our buildup of inventory engines is that it is allowing us, for almost the first time in 30 years, to discuss programmes with the MROs which are managing work for their own or third-party significant fleets.

In this area, ELF and our majority-owned parts company, INAV, acquired in 2017, are putting forward compelling propositions to supply short- and medium-term engine leases and very competitive pricing on the used serviceable material (USM) that INAV has been able to source competitively through this crisis.

In past industry downturns, this was not an option open to ELF because it did not have the required scale of engines available or the access to an in-house parts company where this combined service could be delivered.

Current versus new-technology strategies

Reflecting the long-term investment strategy whereby ELF owns and holds assets for a considerable number of years, our portfolio emphasis is always on the latest technology and more populous engines.

Unlike some of our competitors, we are not restricted by any particular original equipment manufacturer (OEM) or even market segment, be it regional, narrowbody or widebody equipment. Instead, we rely

on our own internal analysis of each engine type, considering all the relative attributes that we determine are relevant to our investment.

Within this model, it is no surprise that the current-technology CFM56-7B, CFM56-5B and V2500-A5 have been the engines to the fore of the leasing market for the past 20 years. Now, as the Boeing 737NG and Airbus A320 are in the process of being replaced by the 737 Max and A320neo and the LEAP-1A, LEAP-1B and PW1100G engines, our emphasis inevitably is moving to these engine types.

However, it must be said that we remain convinced that the current-technology engines still have several years' operation and we are still of the view that, at the right price, they continue to represent a good investment prospect. The dynamics of the retirement of the host aircraft does, of course, get factored into our investment decisions. Once again, it is here that our detailed market knowledge and experience allows us to make decisions with confidence.

While the LEAP and PW1100G engines have been a focus for the past few years, the lack of reliability on their entry into service (EIS), combined with the cessation of the Max deliveries, has meant that there have been very few opportunities to acquire each of these engine types.

As the EIS has been overcome, and largely unrelated to the pandemic impact other than it allowed the OEMs time to fix the issues, we are now seeing LEAP and PW1100G deliveries increase. This, combined with our continued extremely low cost of funds, is presenting us with significant opportunities to meet our customers' requirements for liquidity and economic value.

Having met these customer expectations at the outset, our comfort with owning an engine for the entirety of its operation and the fact that engines have not been commoditised to the same extent as aircraft, ensures that the vast majority of our customers know that, when they do a deal with ELF, they will have a lessor which will be with them through the cycle's ups and, especially, as our customers are now finding in this Covid-19 crisis, downs.

It will continue to be the case that we will maintain the strategic imperative of investing in assets we expect to lease a few times through their period of ownership and, therefore, the new-technology LEAP and PW1100G engines will be to the fore of our investment strategy in the years ahead.

Widebody strategy

As mentioned previously, ELF is not restricted by virtue of OEM or market segment in its investment decisions. This has meant that ELF has always played an active role in owning widebody engines. Sometimes these widebody engines have come as part of a narrowbody/widebody package but also it has often been the case that ELF has sourced widebody engines individually or as part of a widebody-only package.

> *"One interesting development in the current crisis is that the OEMs are being forced to reconsider and re-calibrate their ownership strategy. This is beginning to open the market in an interesting way."*

Although the same more populous attributes used for our narrowbody strategy must be tempered because of the sheer lack of widebody deliveries, we are very comfortable to invest in the ones we identify as the better investment candidates. This will continue reflecting our long-term ownership model through the Covid-19 crisis.

In fact, one interesting development in the current crisis is that the OEMs are being forced to reconsider and re-calibrate their ownership strategy. This is beginning to open the market in an interesting way.

Like all in the industry, the proposed GECAS sale to Aercap has our attention. In ELF's case, our interest is in what it will do to the GE strategy around its widebody deliveries. This is where we have found the soon to be sold OEM in-house lessor to be extremely competitive to the detriment of our ability to penetrate this market in the numbers that we would have previously planned.

There is no doubt that other widebody OEMs are looking at their own strategies and it is likely that their imperatives to strengthen their manufacturing base as they come out of the crisis will provide excellent opportunities for the independents of scale.

As the largest independent owner of engines from all OEMs, ELF is uniquely positioned to speak to the global airlines, with diverse fleets, about all their engine requirements. Having been a modest leasing enterprise for the first part of our history, and as OEM ownership on some engine applications reduce, we see tremendous potential to invest and expand in the widebody segment for the newer technology engines that we rank as good investment candidates.

All of this is consistent with our long-term investment horizon, and ELF is comfortable continuing to invest in this segment of the market, even while it is evident that the widebody segment will take some time longer to recover than the more domestic focused narrowbody market.

In taking this approach, ELF believes it is truly meeting our customers' requirements in the good times and, more importantly, in the bad times we see today.

Opportunities – investment

In the depths of this crisis, there is some blind optimism and "wishing" that it will all get better. As in previous cycles, there are many, such as banks, which will exit aviation rather than provide liquidity when needed and others which will opportunistically enter at the bottom to make the aggressive returns that their private equity investors will demand over the near term. At both ends of this, these providers (although there are many good people working for them) do not truly deliver what the customers need – namely, consistent and competitive access to a variety of funding sources.

ELF has consistently shown its ability to deliver full asset value at market-leading rental rates with flexible offerings that our customers will value as the recovery takes hold and into the longer term.

As we have seen the new-technology deliveries of spares increase and the current access to competitive liquidity options for our customers reduce, we have increased our investment targets for 2021. We will, if we achieve them all, see an increase over 2019 levels. Should our customers require, this is a level that we can increase further as we match our access to competitive funding rates with competitive lease rentals for our customers.

Having grown the portfolio through each of the cyclical downturns in our 30-year history, ELF is extremely confident that we will look back at this cycle as one where we were able to use our considerable scale to provide our existing, and new customers, be they widebody, narrowbody or regional operators of domestic or international focus, consistent and competitive liquidity at the time they really need it.

Our engine specialisation and long-term investment horizon allows our customers to know that when ELF is their engine provider, they will get the value for money that they clearly need in the downturns.

Opportunities – placement

As the current period of massive oversupply has come about, ELF has seen inventory grow to the point that it is now at unprecedented levels. Obviously, this is not the best scenario for a lessor, but it is the inevitable consequence of the business having to engage with the realities of our customers.

One consequence of this increased inventory is that ELF has seen opportunities to deliver new offerings to an expanded population of customers.

As the world narrowbody fleet transitions in the next few years and the current, and probably future, oversupply continues, one

Continued on page 22

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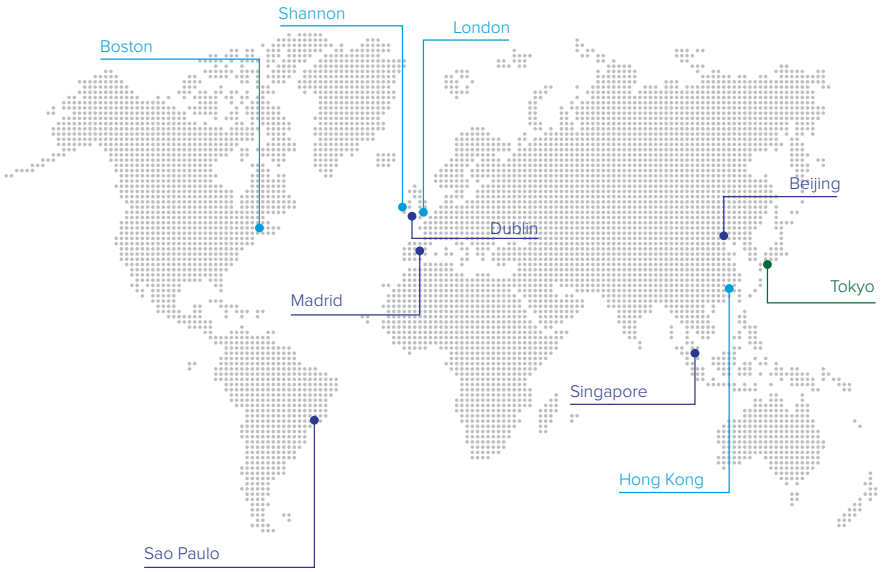

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interesting development at ELF has been the synergies and opportunities we have seen come about as we bring our parts company and existing technology portfolio together to offer the MRO segment a premium programme product.

This programme offering is allowing us to offer programmes of size whereby we can deliver engines all along the scale from zero-time since overhaul to greentime and almost run-out and to combine it with the USM offering from our INAV parts company.

As many of the parts being offered have come from engines that we have owned since new, with complete operating histories being available, we see this as an attribute that many of the competitors cannot provide. This reliability combined with the extremely competitive pricing that we can offer because of the long hold periods for our assets is allowing us to increase our penetration with the MROs in a way that was not previously possible.

It is the scale we can provide that is allowing the MROs, be it for their own or a third party's fleet programme, be confident that we will deliver through the period ahead as shop visits begin to be required in decent numbers.

This programme of scale is not limited to MROs and as airlines have brought increased focus on cost/shop visit avoidance, ELF is now able to offer to help through flexible and cost-effective lease placements that allow airlines to postpone shop visits of their own and leased/financed assets. In doing so, ELF and the customer are saving, in this immediate period of this crisis, the need for considerable cash outlay. It is not good news for the MRO but reflects the views of many in the industry that the full recovery of shop visits will not occur until 2024 at the earliest.

ELF – a parts player

One tremendous difference for ELF in this cycle has been the opportunity to liberate the value in our engines through our in-house parts company, INAV. This has provided a seamless and transparent outcome for ELF. In the past, ELF was at the mercy of the third-party parts market when it made the decision not to invest further in its assets.

We will continue to bring the synergies provided by INAV and ELF combining our offering to ensure that airlines, but particularly MRO customers, can see flexible and competitive offerings. Depending on the retirement profile of the current technology aircraft, this use of current engines and USM will materially impact customers' efforts to keep costs, and cash outflows, down as the recovery comes.

Conclusion

In overall terms, I want to acknowledge that, along with the rest of the world, the aviation industry and all our customers, ELF has been detrimentally affected by the crisis.

As we embrace the challenges of this current market, and attempt to see the future ahead, it is critical that all lessors refocus and consider how best to meet customers' needs in the current market.

ELF has reviewed and revised its model. Our placement activity has switched to meet airlines' requirements for flexibility around lease tenors and lease terms. In doing so, we are seeking to stimulate the demand for our product that will allow the airlines to return profitably to the skies as the travel market reopens globally. This work also allows us to deliver, through MROs, new products that give the airlines the best support that the combined strength of the MROs, ELF and INAV can provide. In doing so, the current technology operators are supported in keeping their costs and outflows down.

In terms of sustainability, ELF has always been at the forefront of investing in the newest, most fuel-efficient aircraft engines. Though a consistent objective, the transition of world fleets to the 737 Max and A320neo aircraft, combined with their more fuel-efficient engines, allows ELF tangibly to move on the industry's credentials in this area.

From ELF's point of view, we will continue to invest through the cycles, and as customer requirements to fund these assets grow, we will continue to extend our access to competitive funding to meet customers' needs.

As has been a hallmark of our independent path since 1990, ELF will continue to pursue the right engines regardless of OEM or market segment. In doing this, and with OEM updated strategies brought about by the Covid-19 crisis, ELF will continue to invest through the cycles in the widebody space. To this end, we look forward to working with OEMs to find the best way to support our mutual customers.

With the recovery still difficult to predict, and tough times still to come for all, I can say with certainty that ELF's door is open, and that we are ready to provide the most cost-effective, across the spectrum of engines, flexible offerings to our customers in the market.

We will ensure that we are around to see the challenges and opportunities of many more cycles to come.

Demand for USM set to increase

The retirement of aircraft earlier than expected because of Covid-19 will lead to a surge of used serviceable material being made available, writes **Kane Antony Ray**.

A prevalent initialism for discussion this year has been USM (used serviceable material), with many predicting a surge in USM use because of aircraft retirements following Covid-19, leading to increased serviceable material use during the cycle of aircraft maintenance. The major benefit to this is the material cost compared with new spares.

Observing the flexible power-by-the-hour offerings of engine original equipment manufacturers (OEM) and maintenance, repair and overhaul (MRO) companies, we can see that used and repaired material is part of the offering depending on customer preference. For example, GE Aviation has long offered USM during its engine shop visits.

Historically, OEM aftermarket support providers and independent MROs have struck agreements with aircraft and engine teardown specialists for a guaranteed level of supply into their maintenance shops to support maintenance options. OEMs also have active trading teams, which acquire available assets for their USM requirements, and similarly, so do independent MROs. Economies of scale are important, particularly when there is an abundance of long-term support agreements.

Currently, aircraft teardown specialists are not committing to regular aircraft teardown schedules because the end-user market demand has decreased as aircraft storage remains high. Fleet utilisation is some way off previous annual levels and operators have optimised fleets to reduce the expense of aircraft maintenance to preserve cash.

In the meantime, market participants have been relying on short-term engine leasing and component repair management for revenue, while being opportune, taking advantage of the discounts available on available aircraft/engines in the market.

Typically, the strategy of an aircraft disassembly specialist is to conduct necessary inspections to meet acquisition criteria before sales to the intended end-user. Before the aircraft is disassembled and even acquired, the expectation is that the specialist would have pre-sold enough inventory to cover the cost of the acquisition and disassembly. This first tranche of sales is almost always related to engines or engine components and landing gears. Component sales after that are profit margin. The specialist will not want to hold inventory in any great quantity for over six months.

During the process of disassembly, the engines are often the deal-breakers, as an opportunity for flipping, greentime leasing, part-out and material sales, or module swaps. Each is a practice that can be employed to reduce maintenance cost, gain full utility of an engine and its components and reduce aircraft downtime.

They are also practices associated with mature and maturing aircraft as a factor in deciding on aircraft retirements and disassembly. For example, there is not a surplus of Boeing 787 components in the market compared with an Airbus A340, linked to the aircraft programme age and in-service versus retired fleets.

There are some if not many exceptions, though, because of component commonality that makes a disassembly viable. By this, we mean a component that is fitted on multiple aircraft or several engines.

Taking an A340-200/-300 as an example, this aircraft was powered by four CFM56-5C engines and did not enjoy the success or longevity of some of its direct competition. The CFM56-5C4/P engine shares a high level of high-pressure compressor (HPC) and high-pressure turbine (HPT) commonality with the CFM56-5B, with the later CFM56-5C4/P being developed from the CFM56-5B/P.

This particularly applies to parts such as HPC and HPT life limited parts (LLPs) and material such as HPT blades. Today, brand new LLPs without discount cost about $1.8million for the HPC and HPT, so used LLPs could represent a large cost saving.

The life limited part cycle limit for these modules is 20,000 cycles, whereas, in the CFM56-5C, the cycle limits range from a low cycle limit of 13,700 to a high of 15,000. Flight hour to flight cycle ratios associated with long-haul aircraft meant that there was often good remaining cycle life on the CFM56-5C engines, which made them suitable for a shop visit run installed in a CFM56-5B engine. Acquiring the A340-200/300 aircraft for the engines was a strategy to achieve impressive profit margins. Inherently, you get double the engines and, once disassembled, they can enter a volume market in the CFM56-5B.

The scenario above could also be applied to other aircraft and engine pairings, but the expected USM we hear about, and particularly with engines, mainly exists within the same engine family. To describe this, we again use the CFM56-5B family. In short, the engine has had and is still expected to have a large requirement for engine shop visits. The earliest examples of the engines are about 24 years old, whereas the youngest are about one year old, with about 50% of CFM56-5B engines never having had their first-run shop visit.

A reliable engine type, a CFM56-5B operating in a benign environment with a thrust rating of 28,000lbf (and below), will likely reach a first shop visit at the point LLP replacements in the HPC and HPT fall due. This has been a feature of the CFM56-5B and -7B, strengthened by CFM's investment in multiple performance improvement packages to improve maintenance cost and fuel burn, and as operators have a policy of engine re-rating (thrust) to gain additional EGT margin and time on-wing.

Considering stored can help identify potential engines for retirement or alternative end-use. However, there are examples of aircraft in genuine storage situations, ranging from lease returns to operator exits. The length of storage is often a telling indicator of the likelihood of an aircraft remaining in storage although, again, during present times, anything parked as a result of Covid-19 impacts remains a grey area.

When assessing CFM56-5B maintenance, it is important to think of the module LLP life limits

Further, CFM56-5B engines of about 13 years old benefit from CFM's first Performance Improvement Package (PIP), a later one occurring from October 2011 for all engines built after those dates. For the majority of these engines, we would expect service re-entry either with the aircraft or to displace an earlier CFM56-5B/P engine given technology, maintenance and fuel burn benefits.

When assessing CFM56-5B maintenance, it is important to think of the module LLP life limits; fan 30,000 cycles, HPC and HPT 20,000 cycles, and LPT 25,000 cycles. The reason for this is maintenance scheduling and to get the best time on-wing performance, a variable depending thrust ratings and operating environment.

Using the most popular CFM56-5B4 engine (28,000lbf), in the optimum operating environment, a 20,000 cycle first run is achievable. An operator is then likely to perform the additional LPT module workscope and LPT LLP replacements to enable the longer 10,000 cycles given that the restored exhaust gas temperature (EGT) should enable more than 10,000 cycles if the fan LLPs did not require replacement. This results in LPT LLP life waste of 5,000 cycles, although fan LLPs will see full consumption at the time of the second shop visit.

Assuming an annual fleet average of 2,800 flight hours with a flight hour to flight cycle ratio of 1.4, many CFM56-5B4 engines would not be due a first-run shop visit until 10 to 11 years of service. At year 16, the fan LLPs fall due, at which point HPC and HPT LLPs will have about 10,000 cycles remaining, and LPT LLPs about 15,000 cycles, assuming new LLPs were installed.

Some observations when considering expected USM maintenance practices on a CFM56-5B engine and other related engine market comments:

- used material supply was historically limited for engines such as the CFM56-5B;
- an increase in USM will likely eliminate previously seen shortages;
- LLP cycle waste over time is likely to have caused a surplus of LLPs, with undesirable cycle life for a further shop visit interval;
- used LLPs could be useful for shorter interval module builds as reduced spend might outweigh the benefit of time on-wing;
- there will remain a desirable LLP cycle life dependent on the operation;
- the most likely engines to have suitable cycle lives remaining are those that have had a second shop visit. While the cycle lives after the first shop visit are desirable, we believe that operators would want to reap benefits from significant investment. Come the time of the second shop visit, other than fan LLP replacement, a core restoration will fall due, representing expense. It is a time when the sum of the parts could likely exceed the value of the complete engine;
- engines without desirable LLP life remaining will offer better earning potential as a greentime lease engine;
- for some aircraft/engines, there will be competition from freight conversion specialists; and
- it is generally thought that the higher the engine build standard, the lower the cost per engine cycle and engine life cost.

USM is a solution for reduced engine maintenance costs, but it will likely need to meet certain life remaining criteria. There are numerous variables across both engine markets that make USM use viable to the extent that each engine must be assessed individually for best suitability.

We believe that populous single-aisle engines such as the CFM56-5B and V2500-A5 will see a better return to service with fewer retirements.

Twin-aisle engine markets could prove to be different, although there is the challenge of greater OEM influence on aftermarket services, and the question of which the key buyers of USM will be which also have twin-aisle engine MRO capability.

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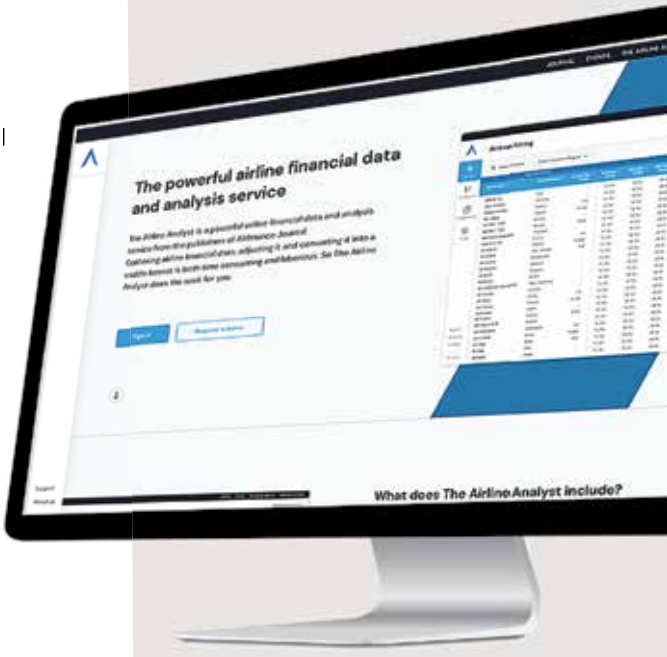

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A safe **haven**

David Rushe, director, sales and marketing, EMEA, Magellan Aviation Group, looks at the engine lease market for freighter aircraft, particularly passenger-to-freighter conversion models.

The effect of reduced passenger demand and ephemeral airline maintenance strategies in 2020 and into 2021 was felt downstream on spare engine lease demand across almost all engine types. This is coupled with the fact that replacement aircraft are coming onstream in all seat categories from 100 to 400 passengers, which had been putting pressure on several engine types anyway.

As with commercial aircraft leasing, the freighter market provided a safe haven for some spare engine owners. The International Air Transport Association's February report put cargo total kilometres about 11% above the same period in 2020 and, notably 9% above the same period in 2019.

I will attempt to summarise the engine lease market across the various freighter aircraft categories in this article as seen from Magellan's perspective.

On the regional aircraft side, the BAe146 and Bombardier CRJ200F models have had some success as dedicated freighters but certainly the sweet spot for regional aircraft has been with turboprop aircraft. The ATR42 and ATR72 classic models have long been popular as freighters, as factory-build or passenger-to-freighter conversion (P2F) models, and this trend is looking like it will continue with the -500/-600 aircraft.

"The Covid-19 market has given the CFM56-3 engine, yet another bounce in demand as its host aircraft programme enters its fifth decade of service."

David Rushe, director, sales and marketing, EMEA, Magellan Aviation Group

Magellan has a well established Pratt & Whitney Canada PW100 lease pool and demand for the older PW120/121 and 124B models certainly picked up last year.

As with a lot of older engine types (a trend replicated across all thrust categories), serviceable engines are at a premium for these older PW100 variants with operators looking to avoid shop visit cost exposure that exceeds the underlying value of the engine.

At the time of writing, Magellan in-house data suggests a total of about 30 ATR72-500 Freighters are in operation. Fedex took delivery of the first ATR72-600 series dedicated freighters towards the end of 2020.

There are some similar trends being seen in the narrowbody sector, albeit on a broader scale. The Covid-19 market has given the CFM56-3 engine, specifically the -3C1, yet another bounce in demand as its host aircraft programme enters its fifth decade of service.

For the right operator, the Boeing 737-400 freighter is a very attractive aircraft with a significant discount on lease rates versus the -800. Short-term rentals for good -3C1 engines are holding firm with pre-Covid 19 rates, and this is best shown by the fact that good serviceable engines can be picked up for less than 50% of the cost of a heavy shop visit.

Fedex took delivery of the first ATR72-600 series dedicated freighters towards the end of 2020

There are engine maintenance, repair and overhaul companies, Aero Norway being a notable example, which are seeing sustained CFM56-3 shop visit demand as the number of serviceable engines shrink. We would expect some further 737 classic P2F activity, because the values of donor aircraft are minimal.

On to the 737NG, one of the definitive characteristics of the Covid-19 downturn has been the ramp-up in demand for donor aircraft for 737-800 freight conversions. There is no shortage of surplus serviceable low-mid-thrust CFM56-7B engines on the market and, given the package freight sector has been the focus market for 737-800 freighter operations, some of this supply can be absorbed without a need for 26k- or 27k-rated engines.

High-thrust CFM56-5B engines, impossible to find on the market just 18 months ago, are readily available but we can expect to see a degree of residual demand from the Airbus A321 P2F programmes being run by EFW and Precision Conversions.

The value profile and underlying market demand of all widebody types has been adversely impacted by the pandemic and will exhibit a longer recovery profile than the regional and short-haul sector. Again, the increased demand for airfreight has provided a chink of light in this segment, for dedicated freighters or belly freight and combi operations.

The key beneficiaries of the swell in widebody freight demand have been greentime CF6-80C2 and PW4000-94 models, particularly those variants applicable to the 767-300 freighter. Donor aircraft values have plummeted in recent years and with the longevity of the established 767 conversion programme, conversion costs are reasonably predictable.

We have also seen the growth of Amazon's 767 freighter operations, including the acquisition of seven aircraft from Delta Air Lines and four from Westjet, all to enter service as P2Fs in 2022.

Magellan data suggests deliveries of about 190 767-300F factory-build freighters, all of which are CF6-80C2B6F or B7F-powered FADEC engines. The CF6-80C2 has always demonstrated more manageable later life shop visit costs (about 30% lower) than the rival PW4000-94 engine, but operators are still keen to avoid shop visit cost exposure.

Average shop visit intervals are about 2,800 to 4,500 cycles depending on the region of operation and utilisation profile applied. The dominance of the CF6-80C2 engine on later-build 767s has ensured steady underlying lease demand; however, the PW4000-94 seemed to have entered a lifecycle phase of prolonged oversupply prior to the pandemic.

The key beneficiaries of the swell in widebody freight demand have been greentime CF6-80C2 and PW4000-94 models

For the PW4000-94 engine, demand has been strongest for the PW4060 and PW4062 engines, as fitted to the 767. Indeed, demand for these high-thrust variants of the PW4000-94 family has been strong for several years. The PW4056 engine has seen some residual demand based on renewed 747-400 freighter operations but it is limited in terms of applicability on 767 operations – notably, towards the end of 2020, there was some evidence of PW4056 oversupply on the market.

A further consideration for PW4000 lease demand is that engines have the Phase III modification (denoted by a -3 suffix), aimed at preventing HPC surge issues, which were prevalent in PW4000 engines in the late 1990s/early 2000s.

PW4000-94 and CF6-80C2 engine models are also fitted to the A300 and McDonnell Douglas MD11 freighter models. The A300 freighter fleet is heavily focused on the operations of UPS, Fedex Express and European Air Transport. Fedex is phasing out its A300s in favour of the 767, whereas UPS is modifying its A300 avionic suites for prolonged operations.

The MD11F is tied to a handful of operators and there are no plans to phase out the type until values for donor aircraft with equivalent lift capabilities fall significantly. All of this points towards prolonged lease demand for PW4000-94 and CF6-80C2 engines.

There will always be a premium attached to greentime engines on the market, particularly as the numbers available tighten. The Boeing-compliant CF6 and PW4000 models will always carry the highest value ranges given the underlying demand for the 767 and, to a lesser extent, the 747-400 for lower-thrust variants.

To give an example of the economics involved: recently observed trading values of good greentime serviceable PW4060/PW4062 engines have ranged from $3.2 million to $4.8 million. However, mature shop visit costs for these engines can easily exceed $7 million, excluding life limited parts work. Lease rates are between $55,000 and $75,000, up significantly since sub-$40,000 a month rentals a few years ago.

On the 757, shortages of serviceable engines have again been the predominant driver of lease demand. The current fleet is divided between the PW2000 and Rolls-Royce RB211-535 models; however, the host aircraft is showing declining appeal for passenger operations in the face of the A321 and there should be no shortage of engines available to support freighter conversions in the coming years.

The A330-300 P2F market is getting to a point where donor aircraft are at values to make the $16 million-plus conversion cost viable so we should expect a ripple effect in terms of demand for lease engines across the PW4000-100 and Trent 700 models.

Again, as the global fleet ages, serviceable greentime engines will be at a premium. As of the time of writing, no CF6-powered aircraft has been earmarked for freight conversion.

Looking ahead, there are a number of factors to shape the engine leasing strategies of freighter operators in the post-pandemic environment. A full recovery in terms of long-haul travel remains some way off, and it is hard to imagine seat capacity and passenger levels approaching 2019 levels until 2023. As a result, there will be an underlying shortage of belly freight volume that will feed ongoing demand for mid-long-haul freighter aircraft, with the 767 looking to be the best fit on the widebody side, particularly as US operators continue to phase out the type.

Current lease demand levels for mid-high-thrust PW4000-94 and CF6-80C2 engines should be sustained into the mid-2020s in tandem with a reluctance to put engines through heavy shop visits.

The A321 and 737-800 P2F programmes will reach a critical mass as the P2F facilities scale up throughput towards the mid-2020s and we will see a resultant swell in applicable engine lease demand.

OEM	Engine	Fair Market Value ($m)	Base Value ($m)	Monthly Rental ($000)	QEC Value Range ($m)	LLP Cost (Est New) ($m)	Overhaul (ex. LLP) ($m)	MTBO	FH:FC
CFM	CFM56-3B1	$0.332m	$0.378m	$19,000	$0.025-$0.100	$3.290m	$1.360m	5,000	1.4
CFM	CFM56-3B2	$0.418m	$0.475m	$20,000	$0.025-$0.100	$3.290m	$1.360m	5,000	1.4
CFM	CFM56-3C1 - 23.5k	$0.614m	$0.698m	$20,000	$0.025-$0.100	$3.290m	$1.360m	7,000	1.4
CFM	CFM56-7B22	$3.031m	$3.295m	$42,000	$0.600-$1.800	$3.780m	$3.210m	21,100	1.8
CFM	CFM56-7B24	$3.576m	$3.887m	$48,000	$0.600-$1.800	$3.780m	$3.210m	21,100	1.8
CFM	CFM56-7B26	$4.103m	$4.460m	$54,000	$0.600-$1.800	$3.780m	$3.210m	19,050	1.8
CFM	CFM56-7B24E	$6.290m	$6.716m	$60,000	$0.600-$1.800	$3.780m	$3.210m	23,150	1.8
CFM	CFM56-7B26E	$7.120m	$7.632m	$68,000	$0.600-$1.800	$3.780m	$3.210m	20,600	1.8
CFM	CFM56-7B27E	$7.410m	$7.960m	$70,000	$0.600-$1.800	$3.780m	$3.210m	18,650	1.8
CFM	CFM56-5B5/P	$3.037m	$3.266m	$44,000	$0.700-$2.300	$3.890m	$3.160m	13,400	1.7
CFM	CFM56-5B4/P	$4.134m	$4.446m	$61,000	$0.700-$2.300	$3.890m	$3.160m	14,400	1.7
CFM	CFM56-5B4/3 PIP	$6.420m	$6.801m	$74,000	$0.700-$2.300	$3.890m	$3.160m	16,500	1.7
CFM	CFM56-5B3/P	$4.600m	$4.947m	$57,000	$0.700-$2.300	$3.890m	$3.160m	15,450	1.7
CFM	CFM56-5B3/3 PIP	$7.156m	$7.455m	$72,000	$0.700-$2.300	$3.890m	$3.160m	18,550	1.7
CFM	LEAP-1A26	$9.650m	$9.850m	$86,000	$1.500-$5.640	$4.570m	$3.620m	20,000	1.7
CFM	LEAP-1A32	$10.950m	$11.173m	$90-95,000	$1.500-$5.640	$4.570m	$3.620m	20,000	1.7
CFM	LEAP-1B27	$10.600m	$11.043m	$85-90,000	$1.600	$4.160m	$3.830m	21,000	1.8
CFM	LEAP-1B28B1	$11.060m	$11.525m	$87-92,000	$1.600	$4.160m	$3.830m	19,500	1.8
GE	CF34-3B1	$0.928m	$0.998m	$20-25,000	$0.185-$0.800	$1.980m	$1.020m	11,500	1.3
GE	CF34-8C5	$2.542m	$2.734m	$30-40,000	$0.550-$0.900	$2.910m	$1.480m	9,500	1.3
GE	CF34-8E5	$3.031m	$3.191m	$35-40,000	$0.550-$0.900	$2.910m	$1.480m	9,500	1.3
GE	CF34-10E6	$4.500m	$4.934m	$50-65,000	$1.375-$1.900	$2.560m	$2.540m	10,700	1.3
GE	CF6-80C2B6F	$1.930m	$2.277m	$50-65,000	$0.300-$0.800	$8.200m	$4.300m	21,500	6.0
GE	GEnx-1B74/75/P2	$19.893m	$20.722m	$210-240,000	$1.960-$4.200	$9.530m	$7.070m	19,500	6.0
GE	CF6-80E1A3	$7.290m	$9.072m	$75-85,000	$1.200-$2.550	$11.660m	$4.860m	19,000	6.0
GE	GE90-115BL	$10.770m	$18.355m	$110-130,000	$0.700-$2.100	$13.580m	$10.570m	30,000	7.5
GE	CF6-80C2B1F	$1.590m	$1.812m	$45-55,000	$0.300-$0.800	$8.200m	$4.300m	21,500	6.0
IAE	V2527-A5	$4.168m	$4.531m	$55-62,000	$0.700-$2.000	$4.070m	$4.100m	19,800	1.7
IAE	V2527-A5 Select	$5.302m	$5.641m	$55-62,000	$0.700-$2.000	$4.100m	$4.070m	23,900	1.7
IAE	V2533-A5	$4.896m	$5.322m	$60-65,000	$0.700-$2.000	$4.070m	$4.100m	14,500	1.7
IAE	V2533-A5 Select	$6.339m	$6.744m	$60-65,000	$0.700-$2.000	$4.100m	$4.070m	17,300	1.7
PW	PW4060	$2.152m	$2.050m	$45-55,000	$0.300-$1.800	$7.520m	$5.540m	18,200	6.0
PW	PW4168A	$3.160m	$3.629m	$65-75,000	$0.700-$3.600	$9.550m	$7.190m	18,200	6.0
PW	PW4090	$4.410m	$5.605m	$90-105,000	$1.000-$2.500	$15.730m	$13.500m	19,000	7.0
PW	PW1127G	$9.500m	$9.698m	$85-90,000	$1.800-$2.500	$4.200m	$3.600m	15,100	3.1
PW	PW1133G	$10.870m	$11.092m	$90-95,000	$1.800-$2.500	$4.200m	$3.600m	17,300	1.7
PW	PW1519G	$7.010m	$7.141m	$75-80,000	$1.800-$2.500	$2.860m	$3.260m	N/A	N/A
PW	PW1524G	$8.640m	$8.806m	$80-85,000	$1.800-$2.500	$2.860m	$3.260m	N/A	N/A
PW	PW1919G	$7.470m	$7.612m	$75-80,000	$1.800-$2.500	$2.860m	$3.260m	N/A	N/A
RR	RB211-535E4	$2.590m	$2.880m	$35-45,000	$0.225-$0.900	$6.130m	$5.000m	22,000	3.1
RR	Trent 1000-J2	$16.565m	$17.291m	$140-165,000	N/A	$7.830m	$7.850m	25,500	6.9
RR	Trent 772B-60EP	$6.845m	$8.293m	$65-80,000	$1.000-$2.000	$9.870m	$9.200m	26,200	4.4
RR	Trent 895	$6.075m	$7.646m	$80-95,000	NA	$12.240m	$9.800m	20,600	5.5
RR	Trent XWB-84	$22.610m	$22.872m	$225-240,000	N/A	$9.130m	$8.350m	21,000	6.9
RR	RB211-524H-T	$1.335m	$1.560m	$20-40,000	$0.125-$0.900	$6.540m	$6.800m	25,250	6.5
RR	Trent 970	$5.690m	$8.550m	$120-140,000	$0.600	$10.770m	$7.550m	25,200	8.8
RR	Trent 7000-68	$17.580m	$17.944m	$185-200,000	$0.650	$8.080m	$7.850m	21,500	4.7

Source: IBA, April 2021

Aircraft Model	Engine Options
717-200	BR700-715A1-30
	BR700-715C1-30
737-10	LEAP-1B28
737-300	CFM56-3B1
	CFM56-3B2
	CFM56-3C1
737-300QC	CFM56-3B1
	CFM56-3B2
	CFM56-3C1
737-300SF	CFM56-3B1
	CFM56-3B2
	CFM56-3C1
737-400	CFM56-3B1
	CFM56-3B2
	CFM56-3C1
737-400SF	CFM56-3B1
	CFM56-3B2
	CFM56-3C1
737-500	CFM56-3B1
	CFM56-3C1
737-600	CFM56-7B20
737-7	LEAP-1B25
737-700	CFM56-7B20
	CFM56-7B20/3
	CFM56-7B22
	CFM56-7B22/3
	CFM56-7B22E
	CFM56-7B22E3
	CFM56-7B24
	CFM56-7B24/3
	CFM56-7B24E
	CFM56-7B26
	CFM56-7B26E
737-700BDSF	CFM56-7B22
	CFM56-7B24
737-8	LEAP-1B25
	LEAP-1B27
	LEAP-1B28
737-800	CFM56-7B24
	CFM56-7B24/3
	CFM56-7B24E
	CFM56-7B26
	CFM56-7B26/3
	CFM56-7B26/B1
	CFM56-7B26E
	CFM56-7B27
	CFM56-7B27/3
	CFM56-7B27/3B1
	CFM56-7B27/3B1F
	CFM56-7B27/B1
	CFM56-7B27E
737-800BCF	CFM56-7B24
	CFM56-7B24E
	CFM56-7B26
	CFM56-7B27
	CFM56-7B27/B1
737-9	LEAP-1B27
	LEAP-1B28
737-900	CFM56-7B24
	CFM56-7B26
737-900ER	CFM56-7B26/3
	CFM56-7B26E
	CFM56-7B27
	CFM56-7B27/3
	CFM56-7B27/B1
	CFM56-7B27E
747-400	CF6-80C2B1F
	CF6-80C2B5F
	PW4056
	RB211-524G
	RB211-524G/H-T
	RB211-524HT
747-400BCF	CF6-80C2B1F
	PW4056
	RB211-524HT
747-400ERF	CF6-80C2B1F
	CF6-80C2B5F

Aircraft Model	Engine Options
	PW4062
	PW4062-3
	PW4062A
747-400F	CF6-80C2B1F
	CF6-80C2B5F
	PW4056
	PW4062A
	RB211-524G/H-T
	RB211-524H2
	RB211-524H2T-19
	RB211-524HT
747-400ISF	CF6-80C2B1F
	PW4056
747-8	GENX-2B67
	GENX-2B67B
747-8F	GENX-2B67
757-200	PW2037
	PW2040
	RB211-535C
	RB211-535E4
	RB211-535E4-B
757-200PCF	PW2037
	RB211-535E4
757-200PF	PW2040
	RB211-535E4
757-200SF	PW2037
	PW2037M
	PW2040
	RB211-535C
	RB211-535E4
	RB211-535E4-B
757-300	PW2040
	RB211-535E4-B
	RB211-535E4-C
767-200ERF	CF6-80A2
	CF6-80C2B2
	CF6-80C2B4F
767-200F	CF6-80A
	CF6-80A2
	CF6-80C2B2F
	JT9D-7R4D
767-300ER	CF6-80C2B6
	CF6-80C2B6F
	CF6-80C2B7F
	PW4052
	PW4056
	PW4060
	PW4060-1/3
	PW4060-3
	PW4062
	RB211-524H
	RB211-524HT
767-300ERF	CF6-80C2B6F
	CF6-80C2B7F
767-300ERP2F	CF6-80C2B2
	CF6-80C2B5F
	CF6-80C2B6
	CF6-80C2B6F
	CF6-80C2B7
	CF6-80C2B7F
	PW4060
	PW4060-3
	PW4062
767-400ER	CF6-80C2B8F
	CF6-80C2B8FG01
777-200	PW4077
	PW4084
	TRENT 875-17
777-200ER	GE90-85B
	GE90-90B
	GE90-92B
	GE90-94B
	PW4074D
	PW4090
	TRENT 884
	TRENT 884-17
	TRENT 892-17

Aircraft Model	Engine Options
	TRENT 892B
	TRENT 892B-17
	TRENT 895
	TRENT 895-17
777-200LR	GE90-110B1L
777-200LRF	GE90-110B1
777-300	PW4090
	TRENT 892
	TRENT 892-17
	TRENT 892B
	TRENT 892B-17
777-300ER	GE90-115B
777-8	GE9X
777-9	GE9X-105B1A
787-10	GENX-1B74
	GENX-1B76
	TRENT 1000-TEN
787-8	GENX-1B64
	GENX-1B67
	GENX-1B70
	TRENT 1000-A
	TRENT 1000-D
	TRENT 1000-D2
	TRENT 1000-D3
	TRENT 1000-G
	TRENT 1000-TEN
787-9	GENX-1B70
	GENX-1B74
	GENX-1B76
	TRENT 1000-J
	TRENT 1000-J2
	TRENT 1000-K
	TRENT 1000-TEN
A220-100	PW1519G
	PW1521GA
	PW1524G
A220-300	PW1521G-3
	PW1524G-3
A300-600F	PW4158
A300-600RF	CF6-80C2A5
	CF6-80C2A5F
	PW4158
A300B4-200F	CF6-50C2
A310-300F	CF6-80C2A2
	CF6-80C2A8
A318-100	CFM56-5B8/3
	CFM56-5B8/P
	CFM56-5B9/3
	PW6124A
A319-100	CFM56-5A4
	CFM56-5A5
	CFM56-5A5/F
	CFM56-5B5/3
	CFM56-5B5/P
	CFM56-5B6/2P
	CFM56-5B6/3
	CFM56-5B6/P
	CFM56-5B7/3
	CFM56-5B7/P
	V2522-A5
	V2524-A5
	V2527-A5
	V2527M-A5
A319neo	LEAP-1A24
	LEAP-1A26
	PW1124G-JM
A320-200	CFM56-5A1
	CFM56-5A3
	CFM56-5B3/3
	CFM56-5B4
	CFM56-5B4/2
	CFM56-5B4/2P
	CFM56-5B4/3
	CFM56-5B4/P
	CFM56-5B6/3
	CFM56-5B6/P
	V2500-A1

Source: Avitas AWIN Fleet Discovery, April 2021

Aircraft Model	Engine Options
	V2527-A5
	V2527E-A5
A320neo	LEAP-1A24
	LEAP-1A26
	LEAP-1A26E1
	PW1127G1-JM
	PW1127GA-JM
	PW1127G-JM
	PW1129G-JM
	V2530-A5
A321-200	CFM56-5B1/3
	CFM56-5B1/P
	CFM56-5B2/3
	CFM56-5B2/P
	CFM56-5B3/2P
	CFM56-5B3/3
	CFM56-5B3/3B1
	CFM56-5B3/3P
	CFM56-5B3/P
	V2530-A5
	V2533-A5
A321neo	LEAP-1A32
	LEAP-1A33
	PW1130G-JM
	PW1133GA-JM
	PW1133G-JM
A321neoACF	LEAP-1A30
	LEAP-1A32
	LEAP-1A33
	PW1133GA-JM
	PW1133G-JM
A321XLR	LEAP-1A32
	LEAP-1A33
	PW1133G-JM
A330-200	CF6-80E1A3
	CF6-80E1A4
	CF6-80E1A4B
	PW4168A
	PW4168A-1D
	PW4170
	TRENT 772B-60
	TRENT 772C-60
A330-200CJ	TRENT 772B-60
A330-200F	PW4168A
	TRENT 772B-60
A330-200P2F	TRENT 772B-60
A330-300 HW	CF6-80E1A3
	CF6-80E1A4
	CF6-80E1A4B
	PW4168A
	PW4168A-1D
	PW4170
	TRENT 768-60
	TRENT 772-60
	TRENT 772B-60
	TRENT 772C-60
A330-300 LW	PW4168
	TRENT 768-60
	TRENT 772-60
A330-300P2F	TRENT 772B-60
A330-800	TRENT 7000-72
A330-900	TRENT 7000-72
A340-300	CFM56-5C2
	CFM56-5C3
	CFM56-5C3/F
	CFM56-5C4
	CFM56-5C4/P
A340-500	TRENT 553-61
	TRENT 553A2-61
	TRENT 556-61
A340-600	TRENT 556-61
	TRENT 556A2-61
A350-1000	TRENT XWB-97
A350-900	TRENT XWB-75
	TRENT XWB-84
A380-800	GP7270

Aircraft Model	Engine Options
	GP7270E
	TRENT 970-84
	TRENT 972-84
	TRENT 972E-84
ARJ21-700	CF34-10A
ATP Freighter	PW126
	PW126A
ATR 42-300	PW120
ATR 42-300F	PW120
ATR 42-320	PW121
ATR 42-320F	PW121
ATR 42-500	PW127E
	PW127M
ATR 42-600	PW127M
ATR 72-200	PW124B
	PW127
ATR 72-200F	PW124B
	PW127
ATR 72-500	PW127F
	PW127M
ATR 72-500F	PW127F
	PW127M
ATR 72-600	PW127M
	PW127N
ATR 72-600F	PW127M
AVRO RJ100	LF507-1F
	LF507-1H
AVRO RJ70	LF507-1H
AVRO RJ85	LF507-1F
	LF507-1H
BAE 146-300	ALF502R-5
	LF507-1H
C919	LEAP-1C
CRJ-1000	CF34-8C5A1
CRJ-100ER	CF34-3A1
CRJ-100LR	CF34-3A1
CRJ-200ER	CF34-3B1
CRJ-200LR	CF34-3B1
CRJ-700	CF34-8C1
	CF34-8C5B1
CRJ-700ER	CF34-8C1
	CF34-8C5B1
CRJ-900	CF34-8C5
	CF34-8C5A1
CRJ-900ER	CF34-8C5
CRJ-900LR	CF34-8C5
	CF34-8C5B1
DHC-8-100	PW120A
	PW121
	PW121A
DHC-8-200	PW123C
	PW123D
DHC-8-300	PW123
	PW123B
	PW123E
DHC-8-400	PW150A
DO-328 Jet	PW306B
E-170	CF34-8E5A1G01
	CF34-8E5G01
E-170LR	CF34-8E5
	CF34-8E5A1G01
	CF34-8E5G01
E-175	CF34-8E5
	CF34-8E5A1G01
	CF34-8E5G01
E-175LR	CF34-8E5A1G01
	CF34-8E5G01
E-190	CF34-10E
	CF34-10E5A1G07
	CF34-10E5G07
	CF34-10E6G07
E-190AR	CF34-10E
	CF34-10E5A1G05
	CF34-10E5A1G07
	CF34-10E5G05
	CF34-10E5G07

Aircraft Model	Engine Options
	CF34-10E6A1G05
	CF34-10E6A1G07
	CF34-10E6G05
	CF34-10E6G07
	CF34-10E7B
	CF34-10E7G07
E-190E2	PW1919G
E-190LR	CF34-10E
	CF34-10E5A1G05
	CF34-10E5A1G07
	CF34-10E5G05
	CF34-10E5G07
	CF34-10E6A1G05
	CF34-10E6A1G07
	CF34-10E6G07
	CF34-10E7G07
E-195	CF34-10E5A1G07
E-195AR	CF34-10E
	CF34-10E5A1G07
	CF34-10E5G07
	CF34-10E6G07
	CF34-10E7G05
	CF34-10E7G07
E-195E2	PW1921G
E-195LR	CF34-10E
	CF34-10E5A1G07
	CF34-10E5G07
	CF34-10E7G05
	CF34-10E7G07
ERJ-135ER	AE 3007A1/3
	AE 3007A2
	AE 3007A3
ERJ-135LR	AE 3007A1/3
	AE 3007A1E
	AE 3007A3
ERJ-140LR	AE 3007A1/3
ERJ-145	AE 3007A2
ERJ-145ER	AE 3007A
	AE 3007A1
	AE 3007A1/1
	AE 3007A1P
	AE 3007A3
ERJ-145LR	AE 3007A
	AE 3007A1
	AE 3007A1/1
	AE 3007A1/2
	AE 3007A1E
	AE 3007A1P
ERJ-145XR	AE 3007A1E
F100	TAY MK. 620-15
	TAY MK. 650-15
F50	PW125B
	PW127B
F70	TAY MK. 620-15
MD-10-10F	CF6-6D
	CF6-6K
MD-10-30F	CF6-50C2
	CF6-50C2B
MD-11F	CF6-80C2D1F
	PW4460
	PW4462
MD-82	JT8D-217A
	JT8D-217C
	JT8D-219
MD-83	JT8D-217
	JT8D-217C
	JT8D-219
MD-87	JT8D-217C
	JT8D-219
MD-88	JT8D-217C
	JT8D-219
MRJ90	PW1217G
S2000	AE 2100A
SJ100-95B	SAM146-1S17
	SAM146-1S18
SJ100-95LR	SAM146-1S18

Source: Avitas AWIN Fleet Discovery, April 2021

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