January/February 2019

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Peter Barrett on Japan Inc. and industry consolidation

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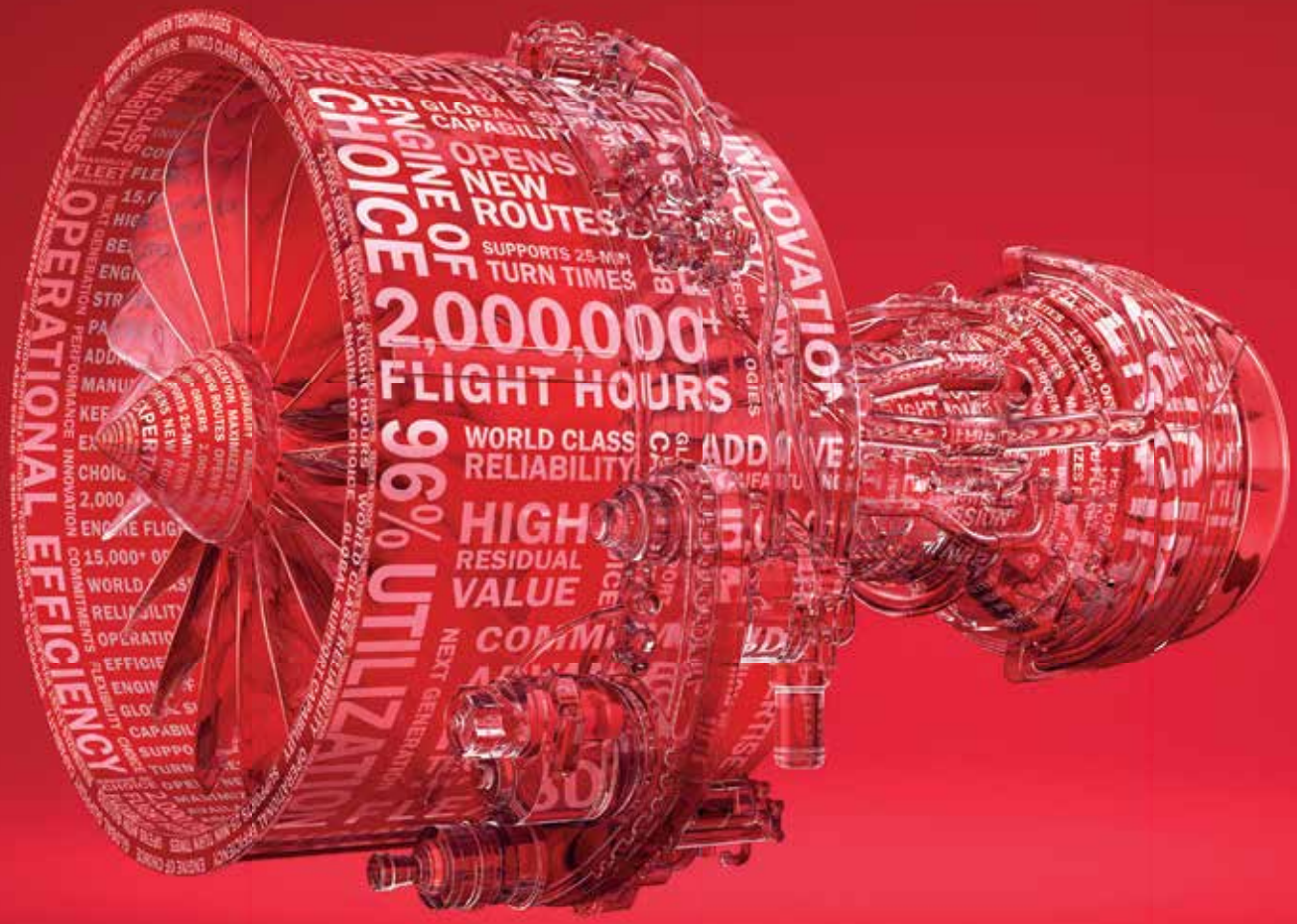

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Why are aircraft lessors **losing value**?

JACK DUTTON
Editor,
Airfinance Journal

Last year was a torrid time for publicly listed aircraft lessors, with only two increasing their share price. **Jack Dutton** asks why.

The stock markets did not give aircraft lessors an easy ride in 2018. AerCap, the second-largest lessor in the world by number of aircraft, started 2018 at $52.97 and 2019 at $40.77. Aircastle's stock fell from $23.67 (4 Jan 2018) to $17.64 (2 Jan 2019), while Air Lease's stock dropped from $48.45 to $30.77 in that same period. Fly Leasing started last year at $12.99 but began 2019 on $10.82. Only two publicly listed lessors gained value during that period: BOC Aviation, which climbed from $41.40 to $62.75 and Avation, which moved from £2.37 to £2.71.

Yes, the global stock markets have lost value over the past year. Yes, US equity markets were soft in December, there were concerns about emerging markets and a growth slowdown in China. But the argument that the public markets undervalue aircraft leasing is still a valid one; it has been a talking point at our conferences for years.

So what do public lessors do when they feel they are being undervalued in the stock markets? Some, such as AerCap, buy back shares. In the third quarter of last year, AerCap spent $87 million buying back 1.5 million shares, putting the total number of shares it purchased for the first three quarters at 10.2 million, costing $540 million.

Since June 2015, AerCap has repurchased 35% of the company. The lessor continually evaluates its options for capital deployment, and it announced a new share repurchase programme of $200 million effective to 31 March 2019. Other lessors, such as ALC, for example, find returns through other means. The Los Angeles-based outfit established the Blackbird and Thunderbolt asset-backed securitisation vehicles to bring new investors to the table which may not have invested in the sector before.

However, the slow Chinese GDP growth and emerging market concerns have unquestionably had an impact on leasing stocks. There are worries about the level of asset demand and the cost of financing those assets, that are changing as interest rates rise.

Many public lessors have significant Chinese and emerging markets exposure. For example, *Airfinance Journal*'s Fleet Tracker indicates that Air Lease has 62 of its aircraft leased to Chinese airlines, about 22% of its fleet.

Investors might be particularly concerned about lessor stocks because some of their lessees have gone bankrupt. The data from Fleet Tracker shows that AerCap had six narrowbodies on lease to Shaheen Air, the Pakistani airline which stopped operating in October after it defaulted on the reported R1.5 billion ($10.7 million) it owes to the country's civil aviation authority.

On the widebody side, AerCap has significant exposure to Norwegian – six Boeing 787s and one Airbus A330-200 – a carrier which has been going through financial difficulties over the past few years. Aircastle has ample exposure to Avianca Brazil (13 aircraft), Jet Airways (13 aircraft) and previously had exposure to Small Planet, before the airline ceased operations at the end of November.

One of the main reasons Avation and BOC Aviation have had more success is because they did not have much exposure to airline bankruptcies compared with other lessors. Also, both entities are neatly positioned in one of the world's main growth markets for aviation, Asia. Another reason is there is limited free float in BOC Aviation's IPO, with Bank of China, the fourth-largest bank in the world by total assets, still owning a majority stake in the Singapore-based lessor.

Airlines

We have seen more than five years of relative stability with airline stocks but, in the past year, they have started to flounder. On 4 January, *Airfinance Journal* reported that investors reacted savagely to a small adjustment by Delta Air Lines to its revenue forecast for the three months to 31 December 2018.

After Delta trimmed its revenue growth guidance to 3% from 3.5%, shares in United, American Airlines and Delta dipped about 10% before recovering slightly on 3 January to trade at about 5% lower than before Delta's update.

The narrative around the sector's operating margins is critical to investors. As soon as there is bad media coverage about airline margins and revenues, investors sell off their shares.

Delta, which has been one of the best-performing airlines in recent years, conceded that "the pace of improvement in late December was more modest than anticipated", but otherwise posted figures at odds with any crisis of confidence. Adjusted pre-tax margin for the quarter, for example, is expected to be 10% to 11%, compared with 9.8% in the fourth quarter of 2017.

The airline also expects a small fall in unit costs and a 3% rise in revenue per seat-mile – results you would not think would spark a sell-off.

"In the past, airlines have competed away gains from lower fuel as they reward customers with lower fares. With oil trending lower in recent months, investors are worried this time will not be different," wrote Helane Becker, an analyst at Cowan, at the time.

Another concern for investors is that record order backlogs are presenting lessors with a weak risk-return proposition. It is not just about borrowing; it is about borrowing at the right price, tenor and from the right sources. Often, it is more about matching the right investors to the product than trying to grow the enterprise quickly.

The market is pricing in reduced growth prospects, a handful of airline failures and record original equipment manufacturer production.

This year may be a time of some changes. It may get easier for lessors to make a return on their investments, but many industry observers believe that the market has not seen many well-priced risk-return deals over the past few years.

So far, 2019 has been mixed from a macro perspective. Progress on US-China trade agreements stimulated the markets but such agreements may be short-lived. With the price of fuel in reverse mode, it is starting to look like a more encouraging year for airlines than originally expected. But as we all know, stock markets and fuel price can quickly change. Trying to predict where they will be in six months is a bit like trying to predict the weather in the UK.

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Low-cost pioneer **Kelleher dies**

Herb Kelleher, the founder of Southwest Airlines and, arguably, the low-cost airline-operating model, died early in January. He was 87.

Southwest started operations in 1971 and became the most consistently profitable airline in history. Last year is set to be its 46th consecutive year of profit.

Parts of the Southwest template were imported to Europe by Ryanair in the 1990s, although the Irish carrier chose to focus on costs rather than Southwest's famously affable customer service – a folksy approach that could be traced directly to Kelleher's influence.

"His vision for making air travel affordable for all revolutionised the industry, and you can still see that transformation taking place today," says Gary Kelly, who became chief executive officer of Southwest in 2004, three years after Kelleher had stepped down from the role.

Kelly adds: "He inspired people; he motivated people; he challenged people – and he kept us laughing all the way."

Herb Kelleher

Boeing Capital appoints new capital markets head

Boeing Capital named Peter Sladic as its new managing director, capital markets and outreach in Decmber 2018, replacing Kostya Zolotusky.

Sladic is responsible for developing and managing an integrated strategy that ensures adequate and efficient financing solutions for Boeing's customers, as well as the company's global stakeholder outreach programme.

Most recently, Sladic was Boeing Capital's senior director of customer finance for the Americas, responsible for structuring financing solutions for Boeing's customers in the region. Before that, he was the director of treasury and investments for Boeing Capital.

Before joining Boeing, Sladic was the treasury director at Juniper Networks in Sunnyvale, California. Sladic has also worked at Bombardier Aerospace in Toronto, Canada, where he served in a variety of roles, including methods engineering, flight sciences engineering, contracts, marketing and sales.

Airfinance Journal reported that Zolotusky left Boeing Capital in November after 33 years with the original equipment manufacturer and its financing arm.

Hendry joins United Airlines as VP and treasurer

United Airlines (UAL) has named Pam Hendry as vice-president and treasurer. She joins from aviation consulting firm Plane View Partners, and will be responsible for corporate finance, treasury operations and risk management.

Hendry is a senior aviation finance executive who has an extensive background in cost-effective aircraft financing. She spent the majority of her career at International Lease Finance Corporation where, among other roles, she served as senior vice-president and treasurer.

"Pam is well known and respected throughout the aircraft finance community. With her reputation as a strong leader and her deep industry knowledge she will be a great addition to the United team," says Gerry Laderman, executive vice-president and chief financial officer.

Pam Hendry

Jet Airways switches Etihad nominee director

Robin Kamark

Jet Airways' board of directors has appointed Robin Kamark as nominee director of Etihad Airways in place of Harsh Mohan.

Kamark, who took up the post on 1 December, is responsible for leading Etihad Aviation Group's minority equity investment strategy, and "optimising business performance, revenue and cost synergies between Etihad Airways and its equity partner airlines." He also "handles strategic leadership for airline partners where Etihad Airways has management responsibility".

Before his appointment to Etihad, Kamark worked as executive vice-president and chief commercial officer of Storebrand, a Nordic financial services group, with responsibility for all commercial activities. He also spent 17 years at Scandinavian Airlines System (SAS), being appointed SAS's global head of sales and marketing in 2008 and becoming group chief commercial officer in 2010.

Airfinance Journal reported on 14 November, via Reuters, that Indian conglomerate Tata Sons was conducting serious talks to acquire a controlling stake in Jet Airways.


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Vedder Price hires shareholder

John Imhof

John Imhof has joined Vedder Price as global transportation finance shareholder in New York.

Imhof has more than 25 years' experience advising lenders, lessors, investors, borrowers and lessees in the domestic and cross-border financing of transportation and logistics assets, including ships, shipping containers, aircraft, railroad rolling stock and related infrastructure.

His experience includes working on syndicated senior secured loan facilities, mezzanine and subordinated loan facilities, letter-of-credit facilities, single-investor leases, leveraged leases, sale and leaseback transactions and restructurings.

Imhof was a partner at Seward & Kissel before joining Vedder Price.

Firefly hires new CEO

Malaysian carrier Firefly has appointed Philip See as its new chief executive officer (CEO).

See was head of strategy and network for Malaysia Airlines, reporting directly to the group CEO. He joined the airline in 2015 from consulting firm McKinsey & Company where he was an associate.

He is, however, "no stranger to the group having previously served in the turnaround management office (TMO) in Malaysia Airlines, back in 2004", states Malaysia Airlines, which owns Firefly.

Under the TMO, he was responsible for implementing the business turnaround plan and consequently the business transformation plan. See left the carrier in 2010 and rejoined Malaysia Airlines in 2015 as a network planner.

Before joining Malaysia Airlines in 2004, See was with Deutsche Bank as a financial analyst in its London office, looking at equity and mergers and acquisition markets in the Asia-Pacific region. He was also a consultant with Arthur Little before joining the airline.

See replaces Ignatius Ong, who joined Malaysia Airlines as group chief revenue officer in June 2018. Ong has since been "double-hatting" as CEO of Firefly and group chief revenue officer.

Other changes in the management include Ibrahim Mohamed Salleh being appointed as CEO of the carrier's cargo unit, MABKargo, and Hazman Hilmi Sallahuddin becoming CEO of its charter airline start-up Project Amal.

Salleh has more than 20 years' experience in various fields within cargo handling with the company, states Malaysia Airlines. Before his appointment as CEO at MABKargo, Salleh was chief operating officer of PT Jasa Angkasa Semesta (a subsidiary of SATS, Singapore).

Sallahuddin was with Khazanah Nasional Berhad where he served in various roles across the organisation. This included senior vice-president of Khazanah Europe Investment based in London. Before that, Sallahuddin was the vice-president of the Khazanah Turkey Regional Office based in Istanbul. He also had a short stint with British Telecom and the GSM Association based abroad.

Rigail becomes Air France CEO

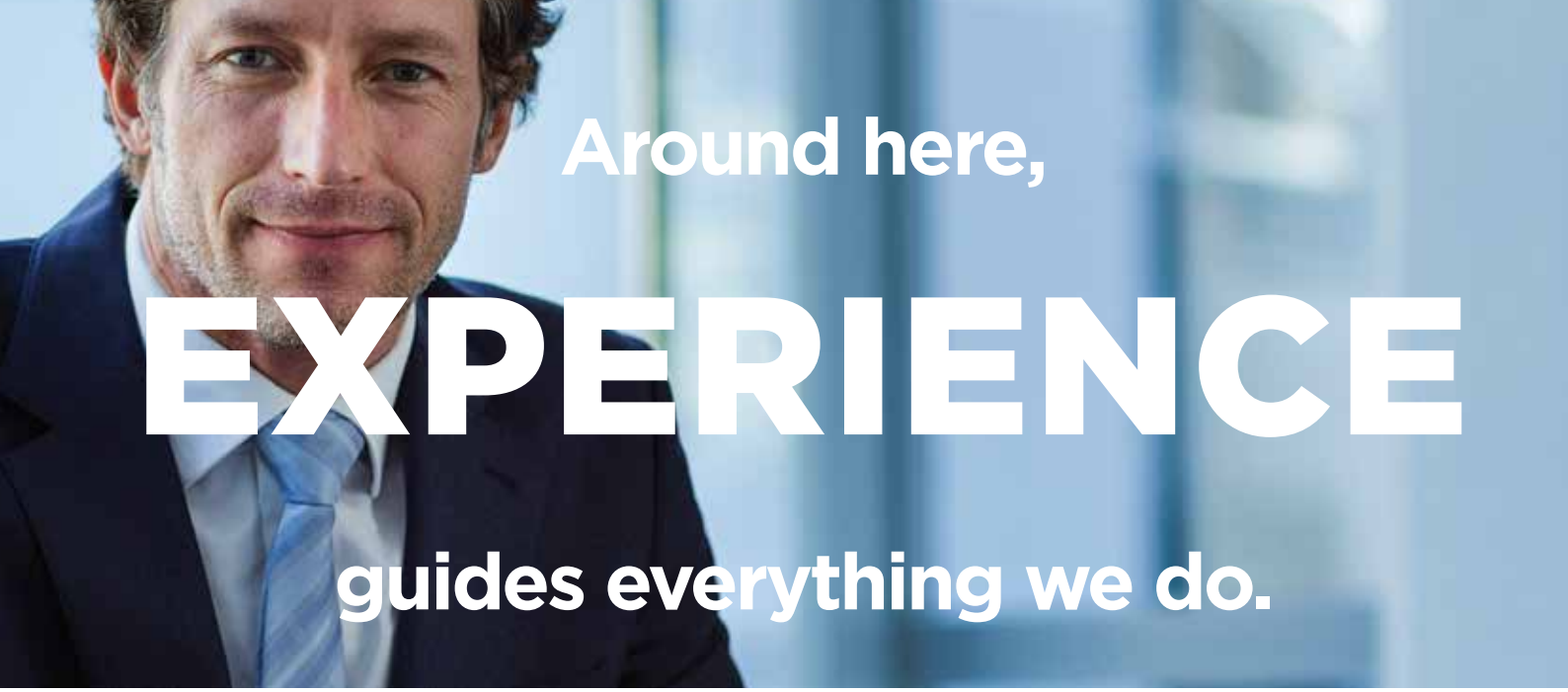
Air France has promoted Anne Rigail, its former executive vice-president customer, to chief executive officer. She replaces Benjamin Smith, chief executive officer of Air France-KLM and acting chief executive officer of Air France since Franck Terner resigned from the post in September.

"Throughout her career, she has always paid particular attention to employees while implementing the many projects and transformations she has led, and placed the customer at the heart of everything she does," says Smith, who adds: "With the support and commitment of every single employee, I am confident we can rise to the challenges for Air France today, ensuring service excellence to all our customers. I have complete faith that Anne will succeed in transforming Air France."

Air France's board has appointed Smith as a director of Air France and confirmed Anne-Marie Couderc as chairwoman of the board. Rigail's first post at Air France was head of customer services at Paris-Orly airport in 1996. She was made executive vice-president of in-flight services in 2013 and executive vice-president customer in 2017.

Her latest appointment makes Rigail one of the very few female chief executive officers in aviation, and the only woman head of a major airline since Carolyn McCall departed easyJet in January 2018.

Anne Rigail



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Airbus picks new executives

Airbus has appointed Dominik Asam to succeed Harald Wilhelm as chief financial officer (CFO) this spring.

Asam, who is CFO of Munich-based Infineon Technologies, will join Airbus on 1 April.

As CFO, he will report to future chief executive officer (CEO) Guillaume Faury and become a member of the Airbus executive committee.

In 2011, Asam was appointed CFO of Infineon Technologies, where he has been responsible for functions including group controlling, IT, treasury, investor relations, compliance and risk management, export control and sustainability and business continuity.

Before joining Infineon, Asam was head of group controlling at RWE in 2010. From 2005 to 2010, he worked at Siemens where he held positions such as CEO of Siemens Financial Services and corporate vice-president and treasurer. Between 2003-2005, he headed investor relations, mergers and acquisitions and strategy at Infineon Technologies.

Asam began his professional career in 1996 in the investment banking division of Goldman Sachs, with postings in Frankfurt, London and New York.

Airbus also has announced the appointment of Michael Schöllhorn as chief operating officer (COO) of Airbus Commercial Aircraft.

Dominik Asam

Schöllhorn was previously COO at BSH Home Appliances in Munich, he succeeded Tom Williams, who retired on 31 December after 50 years in the aerospace industry, 19 of which were in senior Airbus management positions.

He also reports to Faury, who will succeed Tom Enders as Airbus CEO after the shareholders Annual General Meeting on 10 April.

Schöllhorn was executive vice-president manufacturing and quality at the Bosch Group from 2012 to 2014, additionally heading the global business unit for chassis and safety sensors.

From 2004 to 2008, he was vice-president of quality management and, from 2012 to 2014, executive vice-president manufacturing and quality.

Air Canada promotes CFO

Air Canada has appointed Michael Rousseau to the new position of deputy chief executive officer and chief financial officer. He will report to Calin Rovinescu, Air Canada's president and chief executive officer. Rousseau will assume oversight for several important corporate initiatives and businesses, in addition to his present responsibilities, including Air Canada Rouge, whose president will now report directly to Rousseau.

Rousseau has been Air Canada's executive vice-president and chief financial officer, with responsibility for the airline's overall financial strategic direction comprising all aspects of financial reporting and planning, investor relations, treasury and controller's operations, taxation, pension administration, internal audit, procurement and corporate real estate.

China Southern GM joins Comac

Wangeng Tan, China Southern Airlines' (CSA) general manager, has been appointed deputy secretary and deputy general manager of the Chinese aircraft manufacturer Comac.

Comac does not say when Tan will assume his new role. CSA did not name Tan's successor. Tan has worked for CSA since January 2006.

Comac's former deputy secretary and deputy general manager, Linzong Liu, was appointed as group executive and deputy secretary of Aero Engine Corporation of China, according to the state-owned Assets Supervision and Administration Commission of the State Council.

Emirates appoints new regional vice-president

Fernando Suárez de Góngora has been appointed Emirates' vice-president of Hong Kong, Guangzhou and Taiwan, replacing Edwin Lau.

He joined Emirates in July 2010 in Madrid, Spain, and has about 30 years' experience in the aviation industry.

Góngora will focus on strengthening the carrier's market share in the regions for which he is responsible.

Lau, who retired from Emirates in December, joined the carrier in 1992. He had been its vice-president of Hong Kong, Guangzhou and Taiwan since June 2007.

Bank of China adds to transportation team

Michael Devanny has joined Bank of China's transportation team.

Devanny has spent the past four years at UK Export Finance (UKEF) in a variety of roles, including in claims and recoveries and short-term underwriting. Devanny spent the past two years working within UKEF's Aerospace and Defence underwriting team headed up by Pat Cauthery. He has worked on several aircraft and defence transactions.

Devanny is joining Bank of China in London as a relationship manager – with both product and coverage responsibilities – in its transportation team headed up by Arnaud Fiscel and which covers aviation, maritime and rail.

Michael Devanny

Bogason to lead Icelandair on permanent basis

Icelandair has confirmed Bogi Bogason as its new president and chief executive officer.

Bogason had served as interim chief executive officer since August, when Björgólfur Jóhannsson resigned after a profit warning. He was chief financial officer of Icelandair since October 2008.

Bogason oversaw the ultimately failed attempt to take over Icelandic low-cost carrier Wow Air.

China Southern CMO joins Xiong'an Airlines

Zhiqiang Guo, China Southern Airlines' former chief marketing officer (CMO), has been appointed enterprise establishment manager of Xiong'an Airlines.

Guo was the chief marketing officer of China Southern Airlines since July 2014.

Newly established Xiong'an Airlines is a wholly owned subsidiary of China Southern Airlines, and will share the same Iata code, CZ, with China Southern and operate under China Southern's resource allocation.

Xiong'an Airlines will introduce Airbus A320s to its fleet and use Beijing Daxing airport as its hub, adds the statement.

Airfinance Journal reported on 3 July that China Southern Airlines was setting up a subsidiary airline in the Xiongan New Area about 100 kilometres south of Beijing.

Boeing Capital anticipates Ex-Im return

Despite whispers of a downturn, Richard Hammond, vice-president and chief financial officer of Boeing Capital, is bullish about the health of the market. **Jack Dutton** reports.

US aerospace manufacturer Boeing expects the Export-Import Bank of the United States (Ex-Im Bank) to return in 2019 after it builds a full quorum for the first time since 2015.

In an interview with *Airfinance Journal*, Richard Hammond, vice-president and chief financial officer of Boeing Capital Corporation (BCC), says: "We are hopeful that Ex-Im will be up and running soon because a lot of our customers like them as a funding source. Ex-Im is a great backstop when there's market disruption. They have not had a full quorum since 2015, which puts pressure on the manufacturers to potentially have to fund."

He adds: "Right now they can only do, without a quorum, deals of $10 million and under. We are hoping in 2019 that Ex-Im gets a quorum and is open for business."

Hammond adds that Boeing is looking at ways for Ex-Im Bank to continue participating in deals but, because of limited options, the original equipment manufacturer has been working more with global export credit agencies (ECAs), such as SACE and UK Export Finance.

In its 2019 Current Aircraft Finance Market Outlook, Boeing forecasts that, in 2019, the industry will need $143 billion to fund growth, compared with $126 billion in 2018. Last year, 4% of the $126 billion was funded by the ECAs, compared with 7% of the total capital projected for 2019.

It also forecasts that, in 2019, 34% of the capital will come from bank financing, 30% will come from capital markets and 26% will come from cash. The rest will be accounted for by export-credit-, manufacturer- and insurance-guaranteed products such as Aircraft Finance Insurance Consortium (AFIC).

AFIC will continue to grow in 2019, believes Hammond.

"I think you will see more participants in future and it has been a very robust product," he says. "By the end 2018, they will have done about $4 billion [in transactions] since their infancy. And if you look at the asset types, credits and jurisdictions, they've pretty much covered the gamut. It's a diverse group of credits they've looked at."

> *"We are hopeful that Ex-Im will be up and running soon because a lot of our customers like them as a funding source."*
>
> **Richard Hammond**, vice-president and chief financial officer, Boeing Capital Corporation (BCC)

AFIC, an insurance-guaranteed product designed for bank and capital market investors which fund new aircraft purchases from Boeing, was launched in June 2017. The new structure provides an alternative aircraft finance insurance product for new aircraft deliveries and is underwritten by four insurance companies: Allianz, Axis Capital, Fidelis and Sompo International (formerly Endurance).

Hammond adds that AFIC deals are becoming more efficient and are now able to close faster than when they started.

"We could see up to $3 billion next year. It does depend though; there's a lot of competition out there because aircraft are an attractive asset class. I think you'll see maybe even different [competing] products.

"I think it will be similar if not higher next year when compared to this year. Many airlines are getting more curious about AFIC. We're getting a lot of enquiries about AFIC. I think other insurers are curious about AFIC and we've talked to a lot of banks that aren't AFIC lenders yet but they're working on it."

He adds that Boeing Capital has seen interest in AFIC from both Asian and western banks.

"All of the main players in aviation finance that would do export credit seem to want to look at this product, so we're seeing some of the same players."

"Bank debt is running high right now," he says. "Slowing bank regulations and the attractiveness of an aircraft as an asset for funding has definitely brought more participants to the table – we expect approximately $50 billion this year or just over [of bank debt financing]."

Despite some concerns that a downturn may be imminent, Hammond is sanguine about the current market climate.

"For the last five years we have heard the same story: that a downturn's going to be next year or in the next two years but then, in our survey, the majority of the investors say: 'We're going to expand our portfolio next year.' So I'm pretty confident. If we have normal interest rate rises, we will be fine. I think anything out of the ordinary would be more of a challenge, but I don't see that happening."

Although Hammond is concerned about escalating global trade tensions, particularly between China and the US, he is optimistic that the aviation industry will adapt over come any changes.

"We're always watching that. There's always something; there's always the global impact but we seem to always work through it, so we're hopeful that'll get resolved soon."

The global economic picture should be manageable for airlines for the time being, providing there are "normal hikes in interest rates", he says.

"Abnormal hikes in interest rates could shock the system [as could] high fluctuations in fuel prices. If the US dollar spikes, fuel becomes expensive and it's the highest cost that the airlines have, so obviously it's going to have an impact."

Hammond says that the market learned to adjust when fuel was $100 a barrel and should be able to do so if fuel rises to that level again.

"Airlines are running a lot better businesses these days and so they adapt a lot quicker on capacity routes. The industry is hitting it on all cylinders at this point. I think they're better at managing the risks. Short term, there's been some impact even from the last spike."

Although some carriers that have been through financial turbulence, such as Jet Airways and Norwegian Air Shuttle, have burgeoning orderbooks, Hammond is unconcerned about those airlines being able to take their orders.

He does not comment on the backlogs, but says there are many market participants still looking to work with these carriers.

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No mid-life crisis as **Centrus considers new aircraft**

Established in mid-September by a group of aviation finance veterans, the aircraft and engine lessor takes a long-term view of new aircraft leases. **Jack Dutton** reports.

Despite its focus on acquiring mid-life narrowbodies, new lessor Centrus Aviation Capital may also consider new aircraft, according to managing director Bill Cumberlidge.

Speaking to *Airfinance Journal*, Cumberlidge says: "The market is pretty hot right now, especially in relation to asset-backed securitisations. I guess, 'get the cash while you can' comes to mind. Certainly, there are a lot of transactions being done whereby new leasing entities are overpaying for aircraft just to win transactions. For us, the common sense market is the so-called 'middle space': 10- to 18-year vintage aircraft."

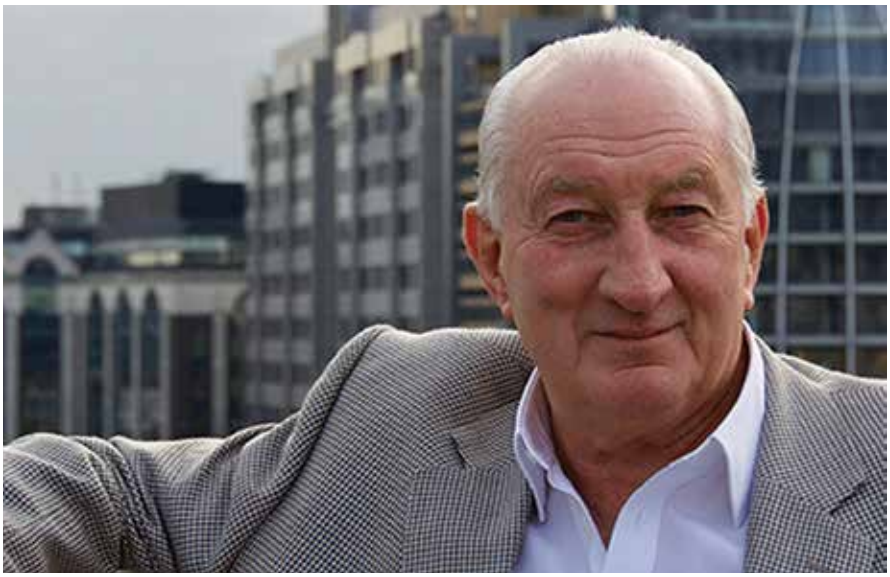
Centrus Aviation Capital was established in mid-September as an aircraft and engine lessor, jointly owned and managed by Cumberlidge, Nick Bowyer and Christopher Taylor. Cumberlidge, with more than 40 years' experience in aviation leasing and asset finance, is a former head of aviation asset management at Allco Finance Group and managing director of Pembroke Capital Leasing, while Bowyer and Taylor were founding partners at Aviation Investment Management. Both have more than 30 years' experience in asset finance, mainly focused on the aviation industry.

Cumberlidge says lessors such as Centrus need to approach transactions differently to lessors doing sale and leasebacks on new aircraft and selling them before their 12-year tenors end.

"The market has changed dramatically and has brought a new meaning to supply and demand. The middle sector is a sector we feel comfortable with in regards to values and assets. However, nothing is simple. Five years ago if a portfolio of aircraft came to market, there would probably be around 10 to 15 bidders; these days the number of bidders has doubled if not trebled, driving aircraft values higher, but returns lower."

He adds: "Ten- to 18-year-old aircraft is our comfort level. Normally we would not look at new aircraft due to the returns, but that does not mean that we will not look at new aircraft transactions. Never say never. Can we be competitive when bidding on transactions like Ryanair or easyJet [though]? Absolutely not.

"However, let's say a 787-9 was in the market for bidders on a 12-year sale-and-leaseback transaction. We would take a 25-year view of the aircraft and we would ride with the best on that bid. Most of the top lessors would sell that aircraft on before the lease terms ran out and the aircraft had to be redeployed. They have the organisations and infrastructures to do that and it keeps the average age of the portfolio down."



> *"The market has changed dramatically and has brought a new meaning to supply and demand. The middle sector is a sector we feel comfortable with in regards to values and assets."*
>
> **Bill Cumberlidge**, managing director, Centrus Aviation Capital

Centrus has begun raising capital for a mid-life aircraft fund of between $50 million and $100 million.

Cumberlidge says that if Centrus is not able to raise the capital, it will raise money on an individual aircraft basis. Although individual aircraft deals cannot give critical mass, Cumberlidge says they allow a lessor to manage the aircraft and know its "returns are going to be pretty firm".

He adds: "If the aircraft comes out of its second lease, the lessor can decide whether to place the aircraft on a five-year, three-year or 18-month lease, convert to a freighter if applicable, or disassemble the aircraft and lease or sell the engines and APUs [auxiliary power units], landing gears, etc. At this time, the decision to disassemble is easy – the sum of the parts is worth more than the sum of the aircraft as a whole."

Cumberlidge says he has no fixed target for the size of Centrus's portfolio, but indicates that it would be no larger than 50 aircraft.

Centrus is still to close a deal, but has placed bids on seven to eight transactions, of which the new lessor is short-listed on two, although, says Cumberlidge, "in this market that means nothing".

EETCs buck trend in booming 2018

Both the secured and unsecured markets for lessors were firing on all cylinders in 2018, writes **Jack Dutton**, and financiers expect this to continue this year.

The capital markets continue to be a primary source of funding for both airlines and lessors. In its 2019 Current Aircraft Finance Market Outlook, Boeing forecasted that this year the industry would need $143 billion to fund growth, compared with $126 billion in 2018. It forecasts that $42.9 billion – 30% of the total financing required for the industry in 2019 – will come from the capital markets, as yield-hungry investors continue to view aviation as an attractive asset class.

The asset-backed securitisation (ABS) markets had a record number of issuances last year, with 14 public issuances and two private ones. This is more than in 2017, when the market saw 12 public issuances and two private ones. The unsecured bond markets remained hot, especially for lessors looking to raise capital at low prices.

> *"Airlines are relatively flush with cash, they've been profitable, some of them have been deleveraging and we have not seen the usual levels of EETC issuance that we've seen in the past."*
>
> **Michael Halaby**, head of aviation/land transport debt origination EMEA, Deutsche Bank

EETC

However, there was an evident lack of enhanced equipment trust certification (EETC) transactions over 2018. *Airfinance Journal*'s Deal Tracker reveals that only four EETCs closed during the year, comprising deals from Air Canada, British Airways, United Airlines and a refinancing from American Airlines, typically a regular issuer in this market.

"Airlines are relatively flush with cash, they've been profitable, some of them have been deleveraging and we have not seen the usual levels of EETC issuance that we've seen in the past," says Michael Halaby, head of aviation/land transport debt origination EMEA at Deutsche Bank.

"Concurrently, we have seen increasing interest in international EETCs: British Airways issued one last year. Given some of the large delivery schedules of international airlines over the next several years, strong investor demand, near-historic low EETC spreads and some bank lenders getting full on certain names, we may see more international EETC issuance in 2019," says Halaby.

Drew Fine, a partner in Milbank's New York office, agrees that the dearth in EETC issuance last year was because of the major US airlines, the prime EETC issuers, being successful from a liquidity perspective.

"They have so much cash on hand that they have less of a need to do new EETC issuances," he says. "The US major airlines want to have a certain amount of cash on hand at a given point in terms of liquidity, so I think there will be new issuances. I don't want to predict how many, but I'd be surprised if they're not doing one or two issuances in 2019."

Fine adds that there will likely be non-US EETC issuances in 2019. Last March, British Airways combined an EETC with a Japanese operating lease with call option (Jolco) equity, raising $608.7 million. Deutsche Bank was one of the bookrunners on the deal, along with JP Morgan and Citi, which was the lead bookrunner.

"I think there absolutely will be more Jolcos with EETCs," says Fine. "People will try and combine Jolco with AFIC [Aircraft Finance Insurance Consortium] transactions. People will try and combine Jolcos with ABS. The Jolco market right now is robust, and people will try to combine it with other products out there to try and get the best possible economics."

ABS

This year's ABS activity included seven issuances from mid-life lessors such as Apollo Aviation, Castlelake and Merx totalling $2.5 billion, while Avolon, GECAS and Air Lease have also tapped the ABS market for a combined $1.8 billion.

In late September, a new platform, Zephyrus Aviation Capital, launched a $336 million ABS deal secured by a collateral of aircraft acquired from Avolon.

"It has been another very strong year for ABS issuance," says Halaby. "We expect this to continue into next year. It's been a useful source of financing for several borrowers, and it helps to diversify and broaden the investor base for aviation assets."

Speaking to *Airfinance Journal* in November, Tony Nocera, Kroll Bond Rating Agency's senior managing director, ABS commercial, was bullish about the market.

"We see all types of lessors and asset managers accessing the markets from the large entities to the companies that operate in the mid-life sector, to the very new platforms like Wings, Aergen and Zephyrus Aviation Capital," he said. "There are all types of issuers and sponsors accessing the ABS markets."

The ABS market continues to be conducive to mid- and older aircraft types, and Halaby expects that to remain a theme this year.

Fine says there is a strong ABS pipeline, with several issuers looking to go first and second quarters of this year. He says that the 144A tradable equity market has given ABS issuers more options from an investor standpoint.

"The 144A tradable equity market has really opened things up," he says. "This new product was first introduced in the GECAS STARR ABS with the second one done in the Air Lease Thunderbolt II ABS. There have now been five 144A ABS equity issuances. Historically, when you've sold equity in an ABS, you sold it to one or two investors and they had to write a big cheque, perhaps $100 million or more.

"The 144A offering expands the potential investor base, so all of a sudden you have between 12 and 25 investors investing in equity and they might be writing cheques

for as little as $1 million each." Fine adds that it is harder for a lessor to sell the equity if it does not have a track record in the ABS market. It will be more challenging for smaller or relatively new leasing companies, such as Zephyrus, to do a 144A equity offering. Longer established leasing companies, such as GECAS, Air Lease and BBAM, have more of a track record to sell to passive investors.

Bonds

The unsecured bond market had a busy 2018, with 46 deals closing for airlines and lessors during the year, according to data from *Airfinance Journal*'s Deal Tracker.

"We continue to see a move towards investment-grade ratings by some of the larger lessors taking advantage of low rates, low yields in order to issue unsecured debt," says Halaby. "We see a move to an unsecured model by lessors; we see the volumes there and expect that to continue."

Fine believes that it will not be long before arrangers combine AFIC with capital markets products, such as the export credit agencies first did in 2009 when there was a lack of bank financing available post-credit crisis. Then, banks were willing to take on government debt but not airline risk.

"I don't think it's a way off," he says. "I think it's just a matter of when the market demands it. Until now, there have been enough banks willing to do AFIC financing. There hasn't been a need for AFIC capital markets, but the demand is growing rapidly."

> *"There hasn't been a need for AFIC capital markets, but the demand is growing rapidly."*
>
> **Drew Fine**, partner, Milbank

AFIC closed deals for 16 aircraft in the second half of 2017 and 28 deals in 2018. AFIC bank deals are closing at faster rates than before and becoming more competitive products.

"In order to justify capital markets [for AFIC], you have to finance a bunch of aircraft at the same time. I think that's coming, maybe not in the first quarter but I'd be surprised if we don't see an AFIC capital markets deal by the end of the second quarter of 2019," says Fine.

Private placements

Companies, including Thai Airways, Intrepid Aviation and Avolon, closed private placements (PP) last year, according to Deal Tracker. Norwegian also came to the market in March, raising Nkr1.3 billion ($168 million) in a private placement that was oversubscribed.

On the lessor side, Nordic Aviation Capital raised $486 million through an unsecured private placement and a Schuldschein (SSD), a private placement instrument that is governed by German law.

Christian Wolff, director, corporate finance, at Helaba, says: "In the private placement segment, we have seen further growth in 2018, as already expected. The comparatively reduced levels of regulation, legal and rating costs supported issuances with more tailor-made structures, non-dollar currencies matching both issuers' and investors' requirements."

He adds: "No liquidity in the private EETC segment, for example, does not mean any disadvantage, as typical buy-and-hold institutional investors who participate partly receive a premium from cost savings against a public transaction, so it can be a win-win for both issuer and investor.

"On the Schuldschein segment, the largest European private placement market, we have seen a few more aviation lessors entering the scene mainly as a diversification to US PP and other unsecured debt and we do expect further potential for aviation SSD deals in 2019. Overall, the corporate SSD segment has grown up with 40% international issuers and still showing over 75% investment-grade-rated issuers."

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Acquiring aircraft **in face of adversity**

Since the mid-2000s, the Kabul-based Kam Air has suffered a fatal crash, drug-smuggling allegations and a terrorist attack on its staff, but the Afghani airline remains resilient despite its misfortune, reports **Michael Allen**.

"Many lessors are averse to placing aircraft into Afghanistan," says Ravil Aksianov, Kam Air's chief executive officer (CEO) and accountable manager.

"Lessors [which do work in Afghanistan] usually set non-industry-standard terms. The security deposits and maintenance reserves are significantly higher and MRO [maintenance, repair and overhaul] selection is mostly non-negotiable. The penalties for defaulting on a contract are severe and higher than, for example, an European carrier," says Aksianov, who previously worked as the airline's director of quality assurance, taking up the CEO role in April 2016.

One lessor, which already has aircraft placed in other high-risk south Asian jurisdictions, says it is studying leasing into Afghanistan, but the risks may be too much to overcome.

"Most likely it's a no-go, but we do look at all opportunities," a senior executive from that lessor tells *Airfinance Journal*.

Kam Air, based in the insecure Afghan capital Kabul but operating in the relative safety of the heavily protected Kabul airport, is in the process of acquiring two ATR42-500s.

> *"Lessors which do work in Afghanistan usually set non-industry-standard terms. The security deposits and maintenance reserves are significantly higher and MRO selection is mostly non-negotiable."*
>
> **Ravil Aksianov**, chief executive officer (CEO) and accountable manager, Kam Air

The airline structured the deal as a finance lease from an "EU-based institution", which Aksianov declines to name.

The addition of these turboprops comes shortly after the successful acquisition of two former Philippine Airlines Airbus A340s, adding to the one A340 already in Kam's fleet. Aksianov says the aircraft were not purchased directly from PAL, but declines to provide further information about the seller.

Kam Air's fleet now consists of 10 aircraft, according to data provided by the airline: three A340s, one Boeing 737-300, one 737-500, one 767-200, one 767-300, one MD-82 and two MD-87s.

Dubai-based aviation consultant Aerotask assisted with the A340 acquisitions and is helping also with the ATRs.

"The overall execution of the deal, taking delivery and subsequent maintenance and dispatch of the aircraft was relatively smooth, save for a few uncontrollable delays," says Aksianov, referring to the A340 acquisitions.

Kam Air's financing options are mostly limited to local banks in Afghanistan, says Aksianov. However, according to Ahmed Zafar, manager, asset management, at Aerotask, Afghan banks did not finance the ATRs. "We would prefer more financing options but not many foreign institutions offer financing and, if they do, it is not on competitive terms," says Aksianov.

Despite the difficulty of obtaining financing, Aksianov is pleased with the aircraft.

"The A340 aircraft is perfect for adding capacity on the longer routes we operate such as Ankara, Istanbul (Turkey), Delhi (India), and Jeddah (Saudi Arabia). We even deploy A340s on our high-density domestic route Kabul to Kandahar," he says.

The difficulty and danger of land travel in Afghanistan, which has been continuously at war since 2001, means domestic air routes are in high demand in the country.

While ongoing violence continues to claim lives on the ground, including at least 54 people in a single day last October, Kam Air has managed to keep flying, with only one fatal accident in its 15-year operating history. On 3 February 2005, a 737-200 travelling from Herat to Kabul crashed into a mountain, killing all 105 on board, according to an investigation report from Afghanistan's Ministry of Transport.

Aksianov declines to comment on the accident and on whether Kam Air's safety has improved since then.

Although no more serious accidents have occurred, the airline is not immune from the country's precarious security situation. In January 2018, nine of its foreign staff – seven Ukrainians and two Venezuelans – were killed in a terrorist attack on the Inter-Continental Hotel in Kabul. Reuters reported four days after the attack that Kam Air was struggling to resume operations because most other foreign staff had left Afghanistan in fear. Kam's average number of daily flights fell from about 37 to about seven, with most domestic flights subject to cancellation.

Up to 40 of the airline's foreign staff were from Ukraine and Kam also leased six aircraft from two Ukrainian companies, the newswire added, but two of the Ukrainian aircraft left the country after orders from home to suspend operations.

"The tragic event was a great loss for Kam Air and our hearts go out to the families and loved ones of the deceased. After the incident, our priorities were focused on the staff and allowing them time to recuperate. Unfortunately, a few employees chose to leave, which resulted in us having to downsize our operations," says Aksianov.

"We are still recovering and not operating domestically at 100% capacity, although we have re-established many of the previously cancelled flights. We are hoping to expand domestic operations before the end of the year, aided by the introduction of the ATR aircraft."

Besides security risks, Kam Air also faces many other "unnecessary hindrances" because of Afghanistan's lack of developed institutions, regulations and aviation facilities, says Aksianov. This increases the airline's costs and places it at a disadvantage compared with other countries' carriers.

Kam Air also has had to contend with a 2013 blacklisting, barring it from receiving US military contracts, over allegations it was smuggling large quantities of opium on civilian flights to Tajikistan. The airline's founder, Zamari Kamgar, categorically denied the allegations, suggesting they were likely a conspiracy perpetrated by his competitors. Aksianov declines to comment.

Domestic competition

Given the extremely challenging operating environment, it is remarkable that Kam Air is not the sole commercial airline in Afghanistan.

Aksianov claims Kam Air is the largest and "most well-established" airline in Afghanistan, but says the carrier still takes competition seriously. At present, the only competition comes from Ariana Afghan Airlines, since Safi Airways has gone out of business. Safi was forced to suspend operations in September 2016 after it failed to clear outstanding debt and taxes, according to Reuters.

Aksianov says his airline is stronger than Ariana, because Kam's active fleet and destinations served are double that of Ariana's.

He says: "This year we have plans to add four aircraft to the fleet, with two already inducted and operating. We are on a growth trajectory and plan to continue this trend. Afghanistan is very much an untapped market and there is a lot of potential for further development."

Assessing lessor risk in Afghanistan

Even those lessors with relatively high-risk appetites would find Afghanistan a difficult jurisdiction to lease aircraft into. A risk manager at a major lessor was willing, anonymously, to share views on leasing into Afghanistan.

***Airfinance Journal*: How would a lessor risk manager typically view leasing into Afghanistan?**

Risk manager: I would assume only aircraft sale – and possibly a finance lease or last lease – is a conceivable option, given the risks associated. You would want to minimise your exposure and investment in the lease, so that the downside risk is minimal if things go wrong. If you have alternatives in known jurisdictions, it would be difficult to consider Afghanistan.

In the current market, most aircraft will find safer homes, and not many lessors have plenty of feedstock such as 737 Classics, older A320s, etc, that could be considered here. Basically, you would be competing with part-out – and getting value out of the last lease with a weak credit and challenging jurisdiction can be very, very difficult. There is no doubt it could be difficult to explain to shareholders and/or financiers if you have exposure to Afghanistan.

What are some of the obvious, and less obvious, risks of leasing into Afghanistan?

Firstly, jurisdiction. Apart from the legal framework and being able to uphold lessors' rights, the potential for instability is also a real concern. One could spend a lot of time trying to get comfortable, but still not be sure whether leasing in is possible.

Secondly, local registration is likely to be a question mark. Perhaps there is enough info out there or precedents to convince one that the legal framework is in place and lessor rights can be upheld. There have been airlines serving Afghanistan with aircraft based elsewhere. Even with locally registered aircraft, having aircraft overnight outside of Afghanistan would be viewed favourably.

Thirdly, repossession risks. If an aircraft gets stuck in Afghanistan and the airline continues to fly within the country (or to countries where no repossession action can be taken), this could be a very difficult proposition.

Fourthly, employees and technical representatives would possibly not be willing or able to travel there. Does your company's insurance even cover travel to Afghanistan?

Would your lessor ever consider leasing into Afghanistan?

I believe this could be considered, but there are several hurdles for any lessor to cross that river. The lessor would need to get comfortable with the credit of the individual airline, including ownership, funding and track record of operations. Deal terms would have to be good enough to convince the management that the risk is worth taking.

Moving into **new territory**

Arnaud Fiscel, head of transportation at Bank of China's London office, tells **Michael Allen** about the bank's aircraft financing strategy and its recent support of the leasing industry.

Arnaud Fiscel has been working with Chinese banks since as far back as 2001 when he joined French lender BNP Paribas. Then, last year, he joined the staff of perhaps China's most well-known bank – Bank of China (BOC).

"I was overseeing the aviation sector in Asia-Pacific for BNP Paribas [BNPP], and partnering on a regular basis with Chinese banks in French optimised lease solutions implemented for major local airlines. In that context, we had built regular and mutually beneficial cooperation with leading PRC [People's Republic of China] banks such as BOC, ICBC and CCB," Fiscel tells *Airfinance Journal*.

His experience working on deals involving Chinese banks was instrumental in forming his market view that Asia – and especially China – is where future growth lies.

"Back then PRC banks would naturally focus their support on Chinese airlines, essentially taking a corporate risk approach, rather than assessing transactions on a secured, asset basis while welcoming guidance from more established aircraft financing players. I recall being invited back in 2006 by a major PRC bank to animate its aviation workshop attended by dozens of local branches willing to learn the basics of aviation finance," he says.

From BNPP, where Fiscel had a "very strong focus" on Asia, he moved to British bank Barclays in 2007, keeping the focus on that continent.

"Following the 2008 global financial crisis, many western banks – essentially European-based – started facing liquidity pressure due to a squeeze on capital and difficulty to access long-dated US dollar funding as a result of the subprime crisis in the US and the collapse of Lehman Brothers. I soon reached the conclusion that the aviation finance market would progressively re-balance towards the East with Asian financial institutions – in particular, Chinese banks – becoming significantly more powerful players," he says.

World's fourth-largest bank by assets

After Barclays, Fiscel spent a year at International Airlines Group (IAG), the Anglo-Spanish airline holding company that owns carriers including British Airways, Iberia and Vueling Airlines, as head of group structured finance. After about a year there, it was back to a French bank, Société Générale, as managing director and head of aviation on the London desk.

Then, in 2017, the call came from Bank of China, and Fiscel left European companies behind to work for the Chinese.

Bank of China's London branch, where Fiscel is based, is situated on Lothbury, a short street in the City of London that borders the Bank of England, the UK's central bank.

BOC, which was established in Beijing in 1912, has had a presence in London since 1929, two decades before the Chinese Communist Party took power. Since then, it has grown to become the fourth-largest bank in the world by assets, according to various sources. The only banks that are bigger are other Chinese banks.

"I think the platform is very robust, as it combines the strengths of a leading, highly reputable global bank with a very strong international network and solid balance sheet as required for a highly capital-intensive sector. Respecting clients and transaction confidentiality, the bank undoubtedly ranks among the most active aviation players," says Fiscel.

He adds that around the time that BOC purchased Singapore Aircraft Leasing Enterprise (SALE) in 2006, the bank started to become more active in aircraft financing. SALE changed its name to BOC Aviation in June 2007.

"The bank has shown some very steady growth in aviation since 2006-07. It started being a participant in large, often plain vanilla, syndicated facilities for major flag carriers, to become sole arranger and underwriter of significantly more complex transactions," he says.

BOC's aircraft financing offering began with commercial deals, before broadening out to tax products such as Japanese operating leases (Jols) and Japanese operating leases with call options (Jolcos).

"Bank of China's product range is quite wide: if solely looking at aircraft financing, it ranges from a commercial financing (on a senior or junior basis) all the way to more optimised structures, including portfolio financing and limited recourse Japanese operating lease solutions," says Fiscel.

Having a connection to BOC Aviation through its controlling shareholding in the lessor provides advantages for the bank's aircraft financing business, though the two companies are careful to maintain appropriate separation between them.

"We naturally benefit from strong interaction and support from BOC Aviation. While we are extremely mindful of keeping all confidentiality aspects preserved and we strictly ensure there is no leakage of information where a potential conflict of interest could arise, there are many areas where BOC Aviation's network, commercial, technical knowledge and market intelligence can only be useful to Bank of China," says Fiscel.

"There is naturally a permanent and fruitful exchange: while we do not communicate any privileged information on actual transactions, we do share views on the aviation market, airlines' performances or aircraft issues, such as recently on a few specific engine matters where it helps to have in-house technical expertise. It's always good and wise to compare notes."

Asked for specifics on what kind of engine matters might benefit from information sharing between BOC Aviation and BOC, Fiscel declines to be specific, saying: "Current engine hiccups are public information and widely known to the industry. More importantly, I believe we do not foresee any specific long-term consequences resulting from recent issues encountered during entry into service of what remains technologically advanced equipment. We remain very optimistic with engine manufacturers' ability to satisfactorily address current matters and provide all required support to airlines and investors. Bank of China has built strong cooperation with most engine partners, some of which we support directly."

> *"There has been a steep widening of BOC's product offering, which I believe is now able to very satisfactorily answer most of aviation finance requirements."*
>
> **Arnaud Fiscel**, head of transportation, Bank of China

Financing lessors

Fiscel says that, with operating leases representing close to half of new aircraft deliveries, BOC has started financing aircraft leasing companies as well as airlines, though he declines to provide any specific transaction details.

"With the opening of BOC (UK) Limited's Dublin branch, we have recently started being significantly more supportive of the leasing industry, providing support to a few leading, selected operating lessors. Depending on the nature of the needs and the creditworthiness of the obligor, the financing is either provided on unsecured or secured basis. It includes, when appropriate, structures on a limited-recourse basis for the right aircraft/lessee/lease parameters mix. This adds to the wide offering of solutions already provided to airlines," he says.

"There has been a steep widening of BOC's product offering, which I believe is now able to very satisfactorily answer most of aviation finance requirements. More importantly, while BOC is fully equipped and experienced to arrange more innovative transactions on a standalone basis, we always welcome cooperation with third-party financial institutions alongside BOC," adds Fiscel.

Disciplined approach

Fiscel echoes the outlook of most aviation bankers when he says BOC has been "very disciplined" about aircraft financing opportunities. When the bank enters into a transaction, it first looks at the quality of the lessee and the aircraft, and will not enter into a transaction if it does not meet the bank's minimum thresholds, he says.

"There are no firmly predefined booking objectives, which could indirectly result in BOC entering into degraded risk/reward transactions. Financing opportunities are all assessed on a stand-alone basis, strictly considering the fundamental merits of

the transaction, often significantly more rigorously than some aviation players. Accordingly, we frequently refrain from making an offer, in particular when we do not believe that the market expectations are in line with our perception of the intrinsic risk," says Fiscel.

"We have observed very tight and fast-reducing pricing; operating in a degraded pricing environment is not without challenges for banks willing to maintain satisfactory returns on equity, which is of paramount importance for Bank of China. Although BOC always strives to offer cost-efficient solutions, we do not consider pricing as the sole element required to provide a competitive offer; we always endeavour to articulate our offer around our clients' requirements, provide innovative solutions in terms of structures, currency, and far beyond."

In such a highly competitive environment, Fiscel says a transaction where risks are not carefully assessed might easily end up being mispriced, impacting the "ratability" of the whole portfolio and, ultimately, investors' interest to remain as long-term players.

"Over the last two decades, there have been several unfortunate examples of financial institutions which aggressively entered the market despite a competitive landscape, before needing to exit. That's not the intention of the bank. We are on a steady growth where every transaction has to make sense on a standalone basis," says Fiscel.

Shift in the market

Fiscel foresees a shift in the market, namely with regard to the large number of airline bankruptcies of late. *Airfinance Journal*'s editor, Jack Dutton, wrote in his November/December 2018 Editor's Letter that a "cruel summer" in Europe had seen five small airlines – VLM, Small Planet Germany, Azur, Skywork and Primera Air – fail to survive in an increasingly competitive airline market.

"Primera will certainly not be the last airline casualty," stated the editorial.

Fiscel agrees, saying it is "highly likely" that more airline bankruptcies will follow.

"Obviously, the environment is changing. First, in terms of pricing environment, fuel and interest rates. Fuel prices started increasing moderately early 2016 and then again mid-2017. Since many airlines are hedged, often up to 18 to 24 months, there is a slight delay in their being impacted," he says, adding that the appreciation of the US dollar is causing headaches for carriers.

"The macroeconomic environment is good but probably not as strong as we would like it to be. The geopolitical environment is unstable," he adds.

"Although it's likely some airlines may face difficulties in the short run, aviation remains a very successful industry, with a traffic growth roughly around 7% over the last 12 months. The market has been doubling every 15 years and it will keep on growing at a similar pace. While it might not keep on growing at the same rate forever, one can expect solid traffic growth will be remaining for many years to come. Adding to expected replacement of existing aircraft, there is proven demand for the foreseeable future," says Fiscel.

Despite these difficulties, he believes that the industry has "significantly improved" since 2001, the year of the 9/11 terrorist attacks.

"Fleets are much more efficient, and airlines have learnt a lot, becoming leaner with significantly lower cost structures and break-even load factors. Obviously, one can never predict a black swan event, but I can certainly say many airlines have benefited from three or four years of strong profits, accumulating healthy cash reserves, enabling them to weather any potential market correction, if any. Of course, some might face significantly more challenges," says Fiscel.

He adds that he "finds it very interesting that some once less-favoured aircraft are now finding friendly homes as a result of engine issues on a few new aircraft programmes. Delays on delivery and engine issues for what we expect to be extremely successful programmes paradoxically resulted in short-term support of older-generation aircraft.

"We've seen A380s having second homes on a wet-lease basis," he says. *Airfinance Journal* reported last August that Air Austral had become the first wet lease customer of Hi Fly's A380, which the Portuguese charter specialist began leasing in July.

Fiscel adds: "We've seen some airlines extending leases on some A340s or taking second-hand A330 or A380 aircraft, which the market would have been negative about a few months earlier."

Chinese-made aircraft

BOC's subsidiary, BOC Aviation, committed to the Chinese-manufactured Comac C919 aircraft back in 2012, when the aircraft was still in the relatively early stages of development.

"This is a launch customer agreement – which means that we are locking in launch customer terms. The whole Comac purchasing process is very different to a western one," said chief executive officer Robert Martin at the time of the 10 firm and 10 option order.

Regarding BOC's appetite to finance this aircraft type, Fiscel says: "Many airlines and lessors have confirmed their interest for the C919 aircraft, which is currently in its flight-test phase. Because of BOC's strong relationship with those players, in particular Chinese airlines, we will naturally be considering financing requests, as and when."

Comac C919

SMBC Aviation Capital focuses on Asia

A new financial regime and prospects for growth in Asia are the reasons behind SMBC Aviation Capital's presence in Hong Kong. **Olivier Bonnassies** and **Jack Dutton** speak to CEO Peter Barrett about the company's plans.

Asian customers account for about 40% of SMBC Aviation Capital's business, up from about 30% when the Sumitomo companies acquired the RBS Aviation Capital platform in 2012.

Eyeing further growth, Dublin-based SMBC Aviation Capital (SMBC AC) set up its first Asian operating company subsidiary in Hong Kong in the fourth quarter of 2018.

In an interview with *Airfinance Journal*, the lessor's chief executive officer, Peter Barrett, points out that SMBC AC has had a presence in Hong Kong since 2002 through an affiliate company.

The opening of a dedicated office in Hong Kong (HK) will allow the lessor to take advantage of new tax incentives offered by the city's government for aircraft lessors.

"The new financial regime is interesting. I don't know where it would lead to and time will tell how many people and how much in asset terms SMBC AC will have in HK. But certainly, it's timely for us to have a presence in Hong Kong," says Barrett.

About 30% to 40% of the lessor's orderbook will eventually be allocated to Asian customers, he estimates.

"We are well placed in Asia and we have Airbus and Boeing deals in place up to the first half of 2020. Our portfolio has grown around the region. Having not just the marketing people, but the credit, legal and technical people in situ in the market has been important and it makes sense to have a subsidiary in HK.

"Beefing up our presence in the region, in addition to Japan, is important. We have 10 people here moving to a larger office. I anticipate a team of 20 people in the next three to five years."

Consolidation

SMBC AC has not been active in the mergers and acquisitions (M&A) market, but Barrett emphasises the growing presence in this market of "Japan Inc".

Over the past 18 months, deals have included Tokyo Century's additional 10% stake in Aviation Capital, Orix's purchase of 30% of Avolon from HNA Group last August for $2.2 billion, plus more transactions with smaller leasing entities.

"It is an interesting strategy but it really depends on the objectives of the companies acquiring a stake in lessors. It is a different strategy from the all-in approach by our shareholders," says Barrett.

The lessor is open to supplementing its organic growth plan via acquisitions.

"We have looked at opportunities but none have worked for us. We will continue to look if we think it fits into our strategy and what we want to achieve for our business. If it doesn't, we will continue to grow organically; we have a strong orderbook and we continue to be active in the sale-and-leaseback market and the trading market," says Barrett.

He adds: "There are a number of businesses, similar to our platform, which are up for sale. I can see a path to continue growing the business organically and if we can accelerate the business that way, we will do it. But I take a pragmatic view. We want to grow the business profitability and consistently and provide good returns to our shareholders."

SMBC AC was a key milestone in leasing consolidation in 2012, when the Sumitomo companies acquired RBS Aviation Capital from Royal Bank of Scotland for $7.3 billion. At the time, the transaction represented the largest sale of an aircraft leasing business and the biggest overseas takeover by any Japanese bank in more than a decade.

"There is a track record of minority investments by Japanese institutions in leasing companies but our shareholders took a different perspective," he says.

> *"In many ways, the Japanese financial crisis of the mid-1990s to the mid-2000s was more of a pause. There was a retreat from aviation financing but they [Japanese financiers] are now stepping back in."*
>
> **Peter Barrett**, CEO, SMBC AC

"Our shareholders rightly believe that having a controlling interest in an entity is the right option. They have been given excellent returns and have also supported our growth."

Sumitomo Mitsui Financial (SMFG) and Sumitomo announced a deal in November 2017 to inject $1 billion into the lessor. The funding will consist of $700 million of equity capital from Sumitomo Mitsui Finance and Leasing (SMFL) and Sumitomo Mitsui Banking Corporation (SMBC), as well as a $300 million subordinated loan from SMBC. The equity transaction closed in November while the loan should be finalised by January 2019.

Barrett says: "We've got plenty of opportunities to deploy that. We've got our orderbook, we continue to be active in the sale-leaseback market and just generally that capital will strengthen our balance sheet."

He adds: "It'll improve our leverage ratios and make them stronger. In general, the broader macroeconomic market is a bit more uncertain and having that extra strength and depth is going to be in our interest."

Japanese investment

Barrett is not surprised by the increasing amount of capital entering the leasing sector from Japan. He points out that historically this has been the case.

"In the 1980s the biggest investors in Guinness Peat Aviation were the Japanese entities, although the dollar amounts were smaller. Still, they were big actors," he says.

"In many ways, the Japanese financial crisis of the mid-1990s to the mid-2000s was more of a pause. There was a retreat from aviation financing but they are now stepping back in. It is a continuing story and I expect them to be present over the next five to 10 years," he adds.

"By acquiring our business, our shareholders wanted to expand their global footprint, and use us as a way to develop business around the globe. It is a good way to expand outside Japan, and aircraft leasing is a good way to get exposure to multiple economies at a high growth rate.

"I can see why 'Japan Inc' sees aircraft as a good investment," says Barrett.

New-technology ramp-up

SMBC AC's fleet consisted of 408 aircraft under ownership and management at 30 June 2018. Having received its final Airbus A320s and Boeing 737-800s, the lessor now focuses on new-technology narrowbody aircraft. SMBC AC placed orders for 110 A320neos, five A321s and 80 737 Max 8s in 2014 and since then it has exercised a further 10 options on its Max order.

Barrett says SMBC AC's orders for 737NG and A320 deliveries peaked in 2015 as the lessor planned to get into the new order stream two years into the Neo/Max programmes.

"We wanted the teething problems to wash through the new lines of the Max/Neo," he says.

New-technology aircraft (A320neo family, Max family, A350s and 787s) represent about a quarter of the SMBC AC fleet but Barrett says this percentage will increase over the next few years.

"I anticipate that by the middle of the next decade new-technology aircraft will represent about 75% of our fleet," he adds.

At low fuel prices, the difference in economics between old- and new-technology aircraft can be negligible. Despite the recent fall of more than 20% in global fuel prices, Barrett says this is likely only to be a short-term trend.

Fuel prices were rising until 3 October, when the price for a barrel of oil hit $86.29, but since then prices have fallen dramatically. On 12 November, there was a rout in the global oil markets, with the price dropping to $65.47 a barrel. It plummeted in December to around $51 a barrel and is now in the high $50s.

The decrease in oil price is thought to be because of fresh US economic sanctions on Iran and a wide sell off.

"It's short-term volatility, which you're going to continue to see in the market. Fuel is driven by lots of different factors and we continue to view the market as highly competitive, especially with the arrival of Neos and Maxes," says Barrett.

He adds: "The best way to hedge fuel in the long-term is to have the most fuel-efficient fleet and that's what our customers are focused on. We're going to see short-term volatility, and that's not going to change."

> *"Ultimately, our decision on investing into an aircraft will always be on what the long-term investment value will be. It is early days but it will depend on how the lessors see that family in a broader context."*
>
> **Peter Barrett**, CEO, SMBC AC

Over the next few years the lessor will take between 40 to 50 aircraft a year, representing between $2 billion to $2.5 billion a year of capital expenditure. In addition, it will continue growing its balance sheet via sales and leasebacks.

The lessor will also continue to sell aircraft. SMBC AC sold about 50 aircraft in 2017, of which 28 units were through a portfolio sale. *Airfinance Journal* understands that the lessor is in the process of selling another portfolio.

Barrett says: "We probably sold more aircraft last year than we anticipated because market conditions were good. We will probably end up with fewer sales this year.

"Aircraft trading has been strong over the past two years for us and we have sold lots of aircraft. We are getting good value and good execution through trade sales, especially bilateral agreements."

A220 interest?

Having only acquired widebody aircraft via sales and leasebacks, SMBC AC is expected to concentrate on narrowbodies in the future.

Barrett says Airbus's takeover of the CSeries programme has changed the dynamics for the programme.

"It definitely influences and changes the dynamics. It gives you more substance around the support and the longevity. It fits into a broader Airbus range."

"But it also depends on how they sell it, where it fits into the product range. Do they see it as a defensive product?" he asks.

"Ultimately, our decision on investing into an aircraft will always be on what the long-term investment value will be. It is early days but it will depend on how the lessors see that family in a broader context."

Engine delays 'will continue through 2019'

Engine delays on models such as Pratt & Whitney's geared turbofan (GTF) and Rolls-Royce's Trent family will continue throughout next year, according to Peter Barrett, chief executive officer of aircraft lessor SMBC Aviation Capital.

In an interview with *Airfinance Journal*, Barrett says: "It's well understood there's been delays both in Toulouse and probably a lesser extent in Seattle. I think the manufacturers are acutely aware of those challenges and they are focusing on trying to get it right."

He adds that, although it will take time to resolve the engine issues, the original equipment manufacturers (OEMs) are beginning to improve them.

"You're going to continue to see delays throughout 2019 and obviously we've planned for that. It's very frustrating for us, and particularly for our customers, when they are waiting for new aircraft and they don't turn up on time."

As SMBC Aviation Capital does not have any Boeing 787s on order, Barrett is more concerned about narrowbody engine delays. The company had 201 aircraft in its orderbook as of November 2018, according to *Airfinance Journal*'s Fleet Tracker, comprising 107 A320neos, 90 737 Max 8s and four 737-800s.

"The delays are more pronounced for Airbus than they are for Boeing but there is an element of blame on both sides," he adds. "I think it's a combination of the engine delays clogging up the system and all the complexities of trying to manage that which is providing some of that delay across the fleet.

"We see it resolving itself today and we see that continuing next year. We're very much giving the message to the manufacturers that they need to focus on getting that right and the delays are a significant issue for us and for our customers."

Significant problems with Pratt & Whitney's GTF first came to light in early 2016, when longer-than-expected start times led to Qatar Airways cancelling the first four of 50 A320neos on order, according to an *Airfinance Journal* report in December 2017. The issue was traced to a thermal deformation issue known as rotor bow, which the manufacturer incrementally addressed with hardware and software fixes to drag PW1100G start times towards those of the IAE V2500 and CFM56 – the A320 powerplants that the geared turbofan was designed to supersede.

Then, however, Pratt & Whitney suffered production difficulties relating to the alloy-based fan blades used in all but the smallest PW1000G variants, forcing it to lower its delivery goal for 2016 from 200 to 150 GTF engines. This led to the embarrassing sight of fully assembled, but engine-less A320neo airframes marooned on the Toulouse tarmac.

Despite suffering a number of engine delays, United Technologies, Pratt & Whitney's parent company, said on a third-quarter earnings call that it would hit its 2018 target for commercial aircraft engine delivery commitments, despite output dropping in the third quarter.

In late October, Rolls-Royce said that it would deliver fewer of its Trent 700 engines than expected because of production issues. Technical problems with the British OEM's Trent 1000 engine, which powers the 787, have also caused it to undertake costly inspections and repairs.

European carriers **take the hit**

Bankruptcy is commonplace in the airline industry, with 53 carriers going under in 2018. **Jack Dutton** examines the trends and asks why this is the case.

The airline industry has always been a volatile one, with bankruptcies common in the sector. Last year was a significant 12 months for airline failures, as the pinch of rising fuel prices and labour costs, as well as rising interest rates, took their toll on carriers.

There were 53 airline insolvencies in 2018 as of 20 November, according to data from the AeroTransport Data Bank. European airlines were most vulnerable to insolvency, with 21 going bankrupt in 2018 (see Figure 1). Latin American airlines were the second most likely to go bankrupt by region, with nine airlines going bust last year. Middle Eastern and Southeast Asian carriers were third most likely, with five airlines from each region declaring themselves bankrupt in 2018.

A European problem

It is not just in 2018 that airline failures were most prominent in Europe. This trend has been seen every year for the past decade, apart from in 2015, when Commonwealth of Independent States (CIS) airlines took the biggest hit. That year, 15 CIS airlines went bust compared with 14 European airlines. This is likely in part because of the international sanctions that were placed on Russia, the CIS's biggest market, in February 2014. The sanctions contributed to the collapse of the Russian ruble and a national financial crisis, causing local airlines to struggle.

Transaero, Russia's second-largest airline, went bankrupt in 2015, at which time it had a fleet of 97 aircraft. Local currency devaluations can often push carriers over the edge. Like many airlines, Transaero's fleet was financed by US dollar debt and its leverage metrics increased substantially. Revenues, which were mainly in rubles, were unable to compensate for those increases.

There are a number of reasons European airlines tend to go bankrupt the most. These include strong competition, the appreciation of the dollar against the pound and the euro and the absence of Chapter 11. Some of these airlines may have shown poor management, leading to high leverage and weak capital structures. These carriers may be highly leveraged because they have easy access to debt capital.

"The sector remains fragmented despite consolidation, with around 200 airlines in operation and the top five carriers accounting for about 50% of intra-European seats," says Angelina Valavina, senior director in the EMEA corporates' utilities and transport team at Fitch Ratings. "This compares with a domestic market share of almost 80% for the four largest US carriers.

> *"The sector remains fragmented despite consolidation, with around 200 airlines in operation and the top five carriers accounting for about 50% of intra-European seats."*
>
> **Angelina Valavina**, senior director, Fitch Ratings

"The key difference is the fragmentation of the European market compared to the US and the very low cost base of European low-cost carriers, especially ultra-LCCs such as Ryanair and Wizz Air," adds Valavina.

Wizz Air and Ryanair, for example, had a cost per available seat kilometres (CASK) of

Figure 1: Number of airline bankruptcies by year and region

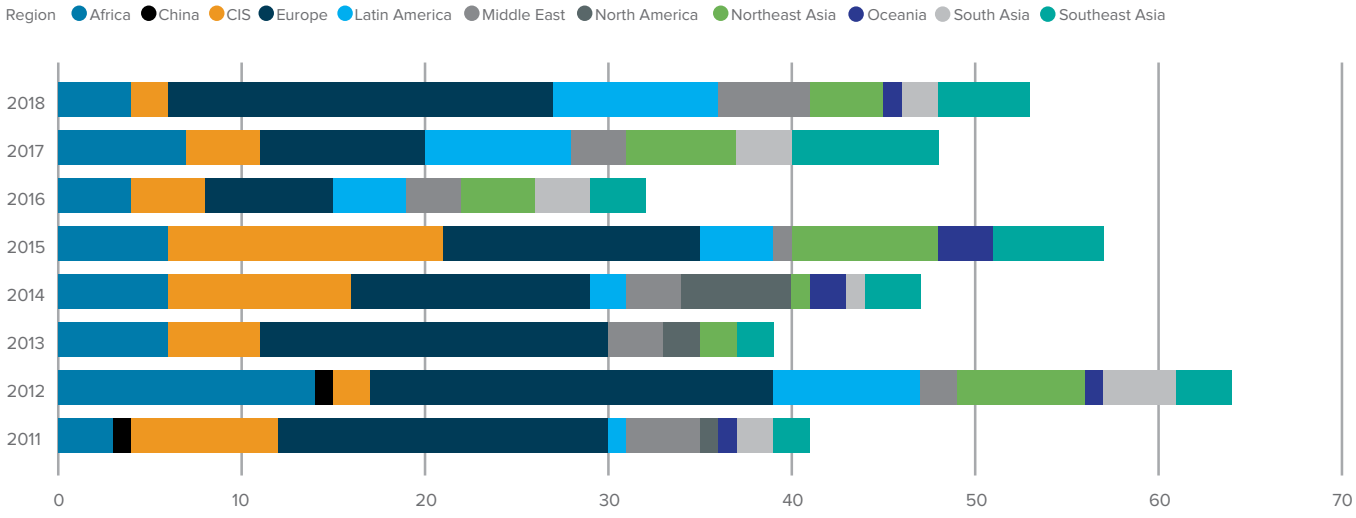
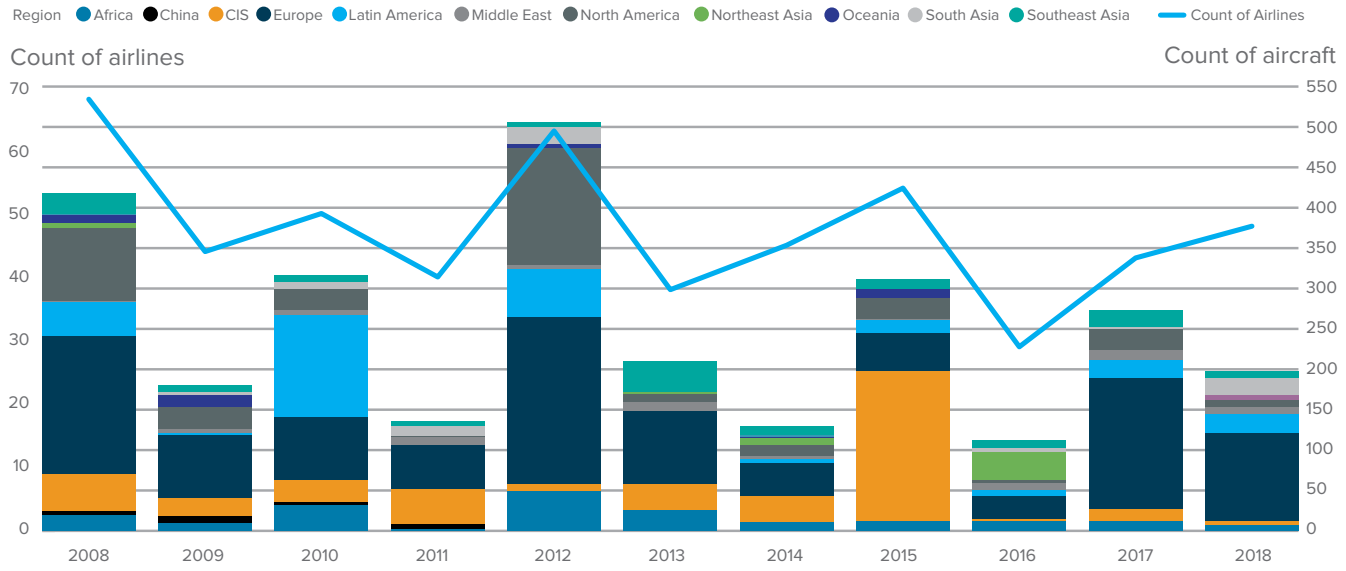


Figure 2: Number of airline failures and number of aircraft by year and region



Source: AeroTransport Data Bank

3.5 USD cents and 3.6 USD cents in 2017 respectively (2017 are the latest numbers). In the US, Southwest Airlines' CASK was 7.2 USD cents and Spirit's was 4.8 USD cents.

"Market fragmentation and the very low cost base of the low-cost carriers create a very competitive environment and effectively lead to the default of uncompetitive carriers," says Valavina.

The top five carriers by seat capacity have 50% of the European market. The other 50% consists of about 195 airlines, some of which are small carriers with less than 10 aircraft. These carriers are more prone to bankruptcy than their larger, often more financially stable, competitors.

Despite the market dominance of the top five carriers, Valavina believes the European market will still remain fragmented.

"I don't think Europe will see the same degree of consolidation as the US because Europe has more national flag carriers. As there are more regulatory and political requirements, consolidation will be slower," she says.

In the past decade, 142 of the airlines that went bankrupt only had one aircraft in their fleet, 102 had two aircraft and 60 had three aircraft in their fleet (see Figure 3). Between 2008 and 2018, only 13 of the 522 airlines that filed for insolvency had a fleet of more than 25 aircraft. 2017 was a particularly tough year for the larger airlines such as Air Berlin and Monarch Airlines, which failed to withstand the pressures of a competitive European market.

The scale of the airline may play a role in most scenarios, but sometimes it does not make too much of a difference, because of factors such as whether it is state- or privately-owned. A government owning an airline might be more predisposed to bail it out of its financial woes, but a private owner of an airline, looking for a specific return, may have less sympathy. If state-backed carriers such as Alitalia or South African Airways were privately owned and suffered the same financial hardships, they may not have been flying today.

"If a company operates in a niche market where its operations are protected, scale may not play a role," says Valavina. "But if it operates in an open European market where there's strong competition, scale is more likely to be a factor."

Airline stocks have taken a hit so far in 2019, after US carrier Delta Air Lines reduced its forecast for fare revenue growth for the fourth quarter of 2018. Share prices of Delta and several other airlines lost between 5% and 9% of their value.

"If you look at airline share prices, you'd think they were having a disastrous time financially," Brian Pearce, chief economist at the International Air Transport Association (Iata), tells *Airfinance Journal*. "In Europe, share prices are down on average about 25% but actually earnings are still really good.

"The bankruptcies in 2018 actually came at a time when the industry as a whole in Europe was delivering profits not quite good as previous years, but still pretty good profits. I guess the issue is, that was not the case for every airline and there were some challenges. Obviously, there were Middle Eastern connections that led to some of those failures," says Pearce, referring to Air Berlin's bankruptcy after Etihad Airways, which owned a 29% stake in the German carrier, refused to continue funding it.

Airline failures in the past decade peaked in 2008, unsurprising given that it was in a middle of a global economic downturn (see Figure 1). Since then, these numbers have generally fallen, hitting a low in 2016 with 32 airlines filing for insolvency. However, since 2016, the number of insolvencies has risen: there were 48 in 2017 and there have been 53 in 2018 up until 20 November, when the data for this article was collected.

More M&A on the way?

In most cases, airlines with weak balance sheets and low levels of liquidity will go bust or be acquired by other, more financially stable airlines. Despite rising interest rates, there is still cheap access to liquidity but stagnant organic growth, driving mergers and acquisitions (M&A).

On a more micro level, Middle Eastern carriers are one of the key drivers of airline consolidation. However, this has levelled off because Etihad has its own issues to resolve and its strategic repositioning and restructuring.

Despite increasing political tensions against Qatar from some of the other Gulf states, the national airline, Qatar Airways, retains its interest in buying equity stakes in other carriers. Last February, it relaunched Meridiana – an Italian carrier in which it owns a 49% stake – as Air Italy, showing an appetite to become part of the European airline consolidation story. On 3 January 2019, it announced it had purchased a 5% share in China Southern Airlines.

There are several airlines showing signs of financial weakness, but look likely to be acquired by another carrier. If the airline has a strong brand, access to valuable taking off and landing slots, could be seen as an

"easy fix", or has taken a significant bulk of the market share, then it is more likely to be acquired rather than left for dead.

In Europe, Norwegian has showed a weak balance sheet, after expanding too quickly and struggling to grapple with fuel price fluctuations and Trent 1000 engine delays for its Boeing 787s. UK regional airline Flybe has also been struggling financially for years, but recently a weak sterling, higher fuel costs as well as a softening of the short-haul market has caused it to post several profit warnings. Only weeks after the airline posted its most recent profit warning, in October, Flybe was put up for sale, on 14 November, confirming it was in discussions with several parties about the sale of the company.

A report from the Sunday Telegraph in the UK said that IAG was a frontrunner in the bid to buy the carrier. Virgin Atlantic is also in talks to buy Flybe, as well as other parties. Other regional carriers in Europe, such as VLM, SkyWorks and Darwin, did not last the cruel summer of 2018.

European regional airlines have been under pressure and the market may go through a similar phase of consolidation as the US did in the 1980s. Then, some of the US regionals, such as Air Midwest, Ransome Airlines and Suburban Airlines, were bought out by the US major carriers, becoming subsidiary regional feeders.

Outside of the regional market in the US, some of the most significant mergers helped bail airlines out of bankruptcy. For example, US Airways merged with American Airlines in 2013 to save the latter from collapsing.

The European market also has seen some regional carriers forge joint ventures or partnerships to strengthen their market presence. Last July, Spain's Air Nostrum and Ireland's CityJet established a new joint venture, which will form the largest short-haul airline group in Europe. Air Nostrum will provide 42 Bombardier CR900/1000 aircraft, while another 28 CRJ900s will come from Dublin-based CityJet.

Europe has also seen some consolidation outside the regional market. On 30 November, Indigo Partners agreed to buy a stake in struggling Wow Air, the same day Icelandair announced it had ditched its planned acquisition of its low-cost rival.

On 5 November, Icelandair agreed to take over Wow, after both carriers showed strain on their balance sheets. However, *Airfinance Journal* reported on 29 November that both companies had agreed not to go ahead with the deal. Icelandic said it was unlikely that its board of directors could recommend to shareholders that they agree to the purchase agreement. Furthermore, the board did not intend to submit to the shareholders' meeting a proposal to postpone decision-making on the purchase agreement.

Bogi Bogason, interim president and chief executive officer of Icelandair, said at the time: "The planned acquisition of Icelandair Group of Wow Air will not go through. The board of directors and management of both companies have worked on this project in earnest. This conclusion is certainly disappointing."

Meanwhile, the chief executive officer of Lufthansa envisions the European airline industry consolidating so, eventually, there will be three global carriers in the continent.

Speaking at an industry event in Berlin on 27 November, Carsten Spohr said: "There are way too many players in Europe. It is obvious that consolidation will act further and we as Lufthansa want to be part of that. There will most likely be three major European network carriers or groups of carriers, plus one or two low-cost guys."

Iata's Pearce says that the uncertain sentiment in Europe, which is pervasive around the continent because of Brexit and the rise of anti-establishment, reformist governments, may halt M&A in the European market.

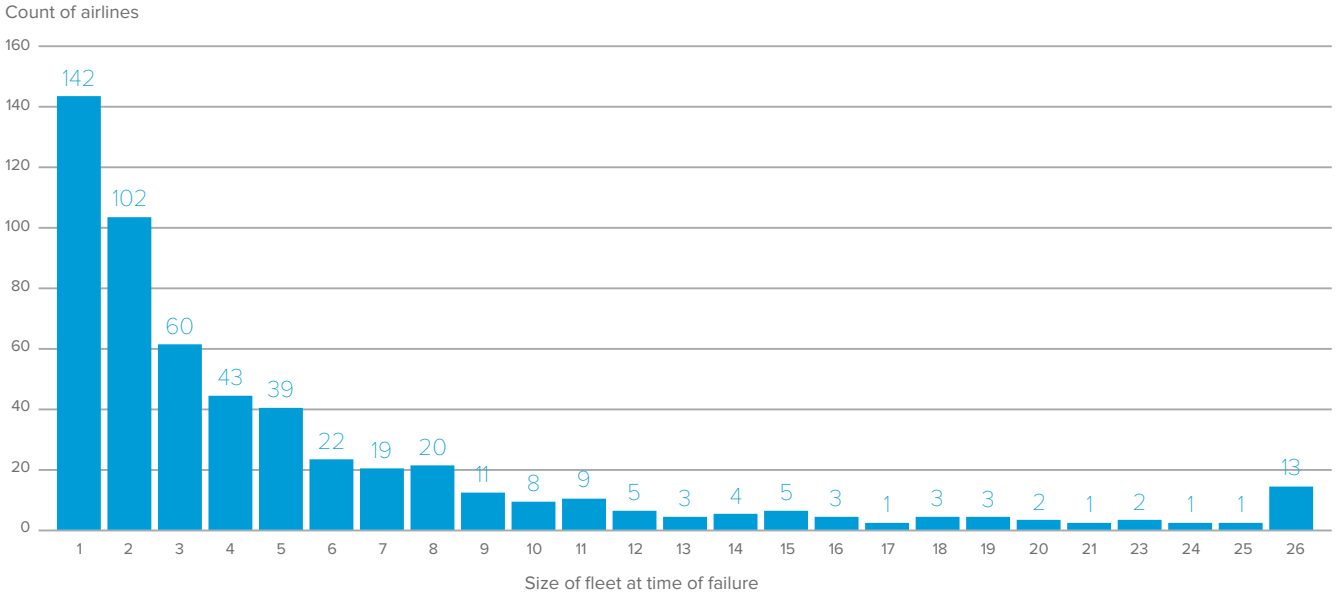
Pearce does not think there will be bankruptcies this year on the scale of Monarch and Air Berlin in 2017.

"I think those were specific business models failing. If we get a recession, then clearly things are going to be very difficult. But, despite the financial market signals, I think the consensus amongst the economists is that there's still going to be growth in 2019."

He adds: "The cost of fuel has plummeted, which takes a lot of pressure off the sector. Last year you were seeing sharp rises in fuel costs, which may have contributed to the bankruptcies, but that's reversed now."

Time will tell as to who will be the victors and the losers, but it is inevitable that the European airline sector will look different a decade from now.

Figure 3: Number of failures by size (2008-2018)



Source: AeroTransport Data Bank

Li takes Dragon under his wing

Established in 2006, Dragon Aviation Leasing was the first operating lessor in China. Gang Li, who was appointed chief executive officer of the 'uniquely' structured lessor in October, tells **Elsie Guan** why he is eyeing more orderly and profitable growth.

Dragon Aviation Leasing was the first operating lessor established in China, in 2006. One of its founders, a Chinese state-owned company, China Aviation Supplies (CAS), established it to fill a gap in the market: China did not have a local operating lessor at that time. It is described as a "uniquely positioned" lessor by Gang Li, the company's new chief executive officer who joined last October, because its shareholding includes both a bank and a lessor.

CAS, an aircraft purchasing and aviation supplies company, which is under the authority of the state-owned Assets Supervision and Administration Commission of the State Council, owns 50% of Dragon. Another three shareholders: AerCap, CA-CIB Airfinance and East Epoch, each own 16.667%.

AerCap is one of the largest leasing companies by aircraft with 1,057 units owned and managed, as of 31 December 2018. CA-CIB Airfinance is responsible for Crédit Agricole Corporate and Investment Bank's aviation finance business. East Epoch became an investor in Dragon in May 2013, bringing the lessor's total share capital to $268 million.

The venture comprises AerDragon Aviation Partners, based in Shannon, Ireland, and Dragon Aviation Leasing, based in Beijing, China.

"Our Irish-based aircraft assets are serviced by the team of Dragon Aviation Leasing in Beijing," Huiying Han, Dragon's senior vice-president of financing and governmental affairs, tells *Airfinance Journal*.

Dragon's Chinese domestic customers include: Juneyao Airlines, Sichuan Airlines, Shandong Airlines, China Eastern Airlines and its Yunnan subsidiary and China United Airlines. The lessor's international customers include: Bangkok Airways, Air France and its subsidiary Joon Airlines, Turkish Free Bird Airlines, GOL Airlines, Spanish Air Europa and Singapore Airlines.

About 70% of Dragon's revenue comes from the Chinese market, while the remaining 30% comes from the international market, Li tells *Airfinance Journal*. "In the next several years, we expect aircraft redeliveries as the existing leases expire," says Li, who adds that he plans to remarket the second-hand aircraft outside China.

"Dragon did not add any new aircraft to its fleet, a conscious decision amid a very competitive market. Going forward, we aim to grow the business, not at any cost, but the company is determined to grow."

Gang Li, chief executive officer, Dragon Aviation

"But we will try to keep our advantages in the Chinese market because Dragon is a China-based leasing company," adds Li. He says that AerCap complements Dragon's business because of the former's influential footprint outside China.

Dragon has 30 narrowbody aircraft in its fleet: 15 Airbus A320s and 15 Boeing 737NGs. The average age of Dragon's fleet is about six years.

"In the past two to three years, Dragon did not add any new aircraft to its fleet, a conscious decision amid a very competitive market. Going forward, we aim to grow the business, not at any cost, but the company is determined to grow," says Li.

According to Li, Dragon's aircraft assets are mainly Ireland-based. "We will continue to diversify our sources of financing," he says, adding that Dragon's banking partners comprise banks from Europe, China and the Asia-Pacific region.

Before joining Dragon, Li was chief accounting officer at AerCap between 2012 and 2018. He led the portfolio valuation and then the successful transformation of its accounting organisation after the acquisition of ILFC in 2014.

From 2006 to 2011, he was AerCap's head of financial planning and analysis, with responsibility for the development of the company's strategic plans.

Li hopes that under his leadership Dragon will make "more orderly and profitable growth". He aims to focus more on the liability management of the company.

"Bad asset management will make a company lose money, but poor liability management could bankrupt a business," he says.

He predicts a more challenging operating environment for airlines in 2019, particularly for those in the emerging markets under currency pressure.

"Those challenges to the airlines will in turn impact the lessors," adds Li, with an air of confidence that his lessor will be prepared for the challenges ahead.

Keeping it **simple**

Jong Chul Kim, chief executive officer of South Korean start-up Air Premia, tells **Elsie Guan** why simplicity is a secret to success in the airline industry.

Jong Chul Kim, former chief executive officer (CEO) of South Korean low-cost carrier Jeju Air, is set to establish a new airline, Air Premia, targeting medium- to long-haul flights without business class.

Despite the increasing numbers of Koreans looking to travel long haul, there are only two Korean full-service carriers: Korean Air and Asiana Airlines.

"The increasing income of Korean people makes them want to travel to long-haul destinations in more comfortable seats and service at a reasonable price," Kim, tells *Airfinance Journal* in an interview. He notes that Air Premia will act as a hybrid service carrier (low-cost as well as point-to-point) in South Korea.

Many non-Korean carriers such as Cathay Pacific Airways, All Nippon Airways, Eva Air operate in the South Korean medium- and long-haul market. According to the Ministry of Land, Infrastructure and Transport of South Korea, the number of seats supplied by non-Korean airlines has risen from 4.5 million to 7.2 million between 2011 and 2017, recording a compound annual growth rate (CAGR) of 8.4%. However, the number of seats supplied by Korean airlines increased from 9.4 million to 11.8 million, or 4% CAGR, during the same period.

"That means this market has room for newcomers as Koreans prefer national airlines," says Kim, adding that Air Premia is expected to use widebodies, either Airbus A330-900s or Boeing 787-9s, sticking with a single-fleet strategy. "Leasing will be a priority," adds Kim, without disclosing the names of lessors in negotiation at the current stage.

Air Premia submitted its air carrier licence (ACL) application on 2 November, and planned to launch its first commercial flight in September 2020. The carrier will start operations with three aircraft in its first year and add two aircraft each year after 2020. By 2022, it is expected to operate seven aircraft.

"We cannot disclose when we will decide on the type of aircraft but it will be around ACL issuance: right before or right after the ACL acquisition," says Kim.

The new carrier had raised $33 million in funds – $11 million of seed and anchor funding and a $22 million series-A tranche – as of September 2018.

After the two fundraising rounds, Air Premia has three kinds of shareholders: the company's management group (36.37%), four anchor investors (45.31%) and some financial investors (18.32%). Anchor investors are invited to subscribe for shares ahead of the initial public offering (IPO) to boost the popularity of the issue and provide confidence to potential IPO investors.

Jong Chul Kim
chief executive officer, Air Premia

The series-A tranche funding was led by Capstone Asset Management, Yuanta Investment, Winvest Venture Investment and some of its anchor investors. "We spread the ownership and funding to strategic investors who we can grow this airline together, namely people who are successful in the IT business and the travel industry," says Kim.

According to him, Air Premia's four anchor investors are Dok Soo Jang, Sung Bum Hong, Chester Jungseok Roh and Kee Whan Ha.

Sung Bum Hong is a co-founder of Hugel, a botox maker in South Korea. The company is listed on Kosdaq, an electronic stock market independent from the Korean Stock Exchange. Dok Soo Jang is a founder and chairman of DS Asset Management, a Korean financial company.

Chester Jungseok Roh is a founder of Tatter and Company, which is a developer of blogging software and acquired by Google Korean in September 2008. Kee Whan Ha is a founder and chairman of Hannam Chain, a Korean supermarket chain which was established in the US in June 1988. Ha is also president of the Korean American Chamber of Commerce of Los Angeles.

"They have a long wish list," says Kim of the company's Los Angeles-based Korean anchor investors. "They want affordable, convenient transportation from LA to Korea," he says, noting that one of Air Premia's US investors has resources and partners such as local airlines and airports which can help Air Premia's US business.

Air Premia has also secured $111 million in investment commitments for its series-B financing round from large private equity houses. It plans to secure another $133 million before launching its first commercial flight in September 2020.

Before Air Premia, Kim was CEO of Jeju Air, the first low-cost carrier (LCC) founded in South Korea. When appointed into the role in 2009, Kim steered the carrier through a difficult time.

"Jeju Air operated [Bombardier] Q400s and Boeing 737s, two different aircraft. They created high complexity and very high costs, he says.

"When I took over I introduced the so-called LCC model, which is single fleet, single class with high-density seats," he adds. Kim phased out the airline's Q400s and kept the 737 fleet in an economy class configuration only.

David Neeleman, founder of Morris Air, WestJet, JetBlue, Azul and, most recently, Moxy Airways, is one of Kim's main role models, when it comes to running an airline.

"As long as we stick with a philosophy of simplicity, we will control our costs, as I did at Jeju Air," says Kim, who adds that he does not think Korean Air and Asiana will follow the premium economy-class model in the next few years.

"It is a promising business model, targeting an emerging segment with low competition at the moment, but it has to evolve into a unique model reflecting our customers' changing needs. It would be very different to an LCC model," Kim says when imagining the future development of Air Premia.

Cyber in the boardroom – do you want to play a game?

Kieran O'Brien, head of aviation finance and leasing advisory, KPMG in Ireland, Mike Daughton, risk consulting partner, KPMG in Ireland, and Tony Hughes, associate director cyber security services, KPMG in Ireland, explain why cyber security games could help airlines and aircraft lessors.

"Do you want to play the game?" This is the question asked when a high school student unwittingly hacks into a military supercomputer while searching for new video games. After starting a game of Global Thermonuclear War, the teenage hacker leads the supercomputer to activate the nation's nuclear arsenal in response to his simulated threat. This, of course, is the plot from the 1983 movie *WarGames*, but, 36 years later, the idea of gamification of cyber attacks is fast becoming a recognised method of educating employees on how to prepare, withstand and recover from a cyber incident.

We can be sure that none of the organisations which have suffered highly publicised cyber incidents were having fun in the immediate aftermath.

In a survey conducted by McAfee (*Winning The Game*, April 2018) of organisations that hold gamification exercises in the workplace, including hackathons, capture-the-flag, red team-blue team or bug bounty programs, almost all (96%) reported seeing benefits.

One of those benefits is that 52% of those companies surveyed noted a marked increase in staff satisfaction and a significant reduction in staff turnover. With the behavioural aspects of the workplace changing to meet the needs of the modern workforce, this is an aspect that cannot be overlooked.

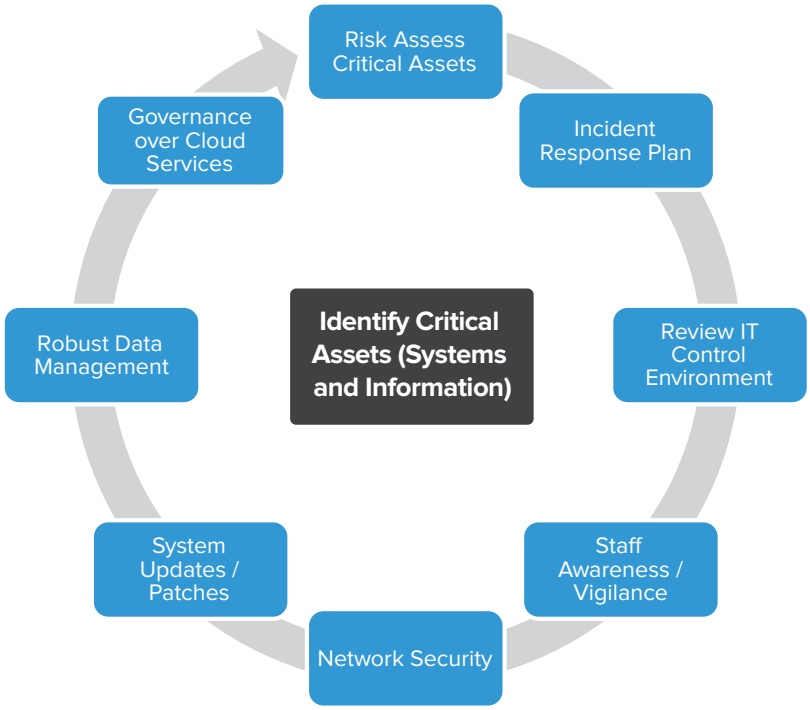
At KPMG, we have developed our own cyber security war game where two teams compete as attack versus defence using a number of security scenarios to consider, including the technical and non-technical threats to system confidentiality, integrity and availability. The game involves considering the amount of resource to apply to a given threat – with both sides looking at the same threat scenario.

As in the real world, the attacker holds more chips than defence and a strategy based on risk is required to determine where to spend on defending those systems. The game helps to identify the value and priority of each asset to both the attacker and the defender. This process is essential when considering what budget to apply to cyber assets, and can be surprisingly enlightening to defenders when they are faced with an attack method that they had considered already defended or too unimportant to defend. The boards and C-suites of lessors and aviation companies in general have been surprised by the results of this exercise and have provided significant insight into their defence planning.

The benefits of such an approach include:

- **identifying your crown jewels**. It is important to identify and understand those assets that may be the focus of a bad actor, and of most critical importance to your company and we have seen an increase in attacks on aviation companies;
- **recognise positive cyber security behaviour**. By recognising good cyber security behaviour within your company, you can reward good aspects, and remove the more risky habits of staff;
- **employee engagement**. Staff from areas of your business who may never have communicated on issues such as cyber security will increase their knowledge and network. Creating a competitive edge to security also engages employees much more than a classroom where trainers just talk to slides and the messaging is lost;
- **training does not feel like cyber security training**. The impact of engaging staff is that they are developing skills without feeling like the training is unrelated to their day-to-day responsibilities. Ideally, an online automated version of the training further reduces the amount of time spent away from operations;
- **opens up additional conversations such as data protection**. Gamification encourages open dialogue among employees regarding issues such as the impact of General Data Protection Regulation (GDPR) on cyber security. These conversations also allow for the sharing of best practice and analysis on the handling of previous incidents; and
- **find your cyber champions**. Using gamification companies can identify those talented members of staff who demonstrate an aptitude for cyber security roles. Given the well-publicised lack of available cyber security talent, this could save time and money on recruitment campaigns and subsequent company training.

Practical steps that a board can take to help support cyber resilience



Gamification is very much reliant on the board having a good understanding of its cyber security posture, and our discussions with our aviation-leasing clients are targeted at board level, because it is the board that ultimately is accountable for managing the risk.

Where gamification adds most value, however, is in the engagement of all staff in the scenario, regardless of experience or job responsibilities.

Often in gamified scenarios it is interesting to observe how quickly and easily staff with knowledge of the company identify both vulnerabilities in your defence, but also the means to exploit them; this knowledge is also available to a motivated and resourceful adversary if it believes that your assets are worth targeting.

Therefore from a board perspective, it is important to demystify the concept of cyber security and how it relates specifically to an aviation-leasing client. One size will not fit all; however, every client, regardless of size, can take steps to help identify and respond to an incident.

Expensive technical support, or software-based solutions, are only part of the answer, and clients of all sizes seek advice on how to identify and respond to the risks posed to their assets from both cyber criminals and non-malicious actions – specifically centred on people, process and technology.

Evolving from those traditional models is a different way of considering the overall approach to securing our assets – this approach is called cyber resilience.

Cyber resilience is being able to prepare for, withstand, rapidly recover and learn from deliberate attacks or accidental events online. Cyber security is a key element resilience, but cyber-resilient organisations recognise that operating safely in a digital environment goes far beyond just purely technical measures. By building an end-to-end understanding of cyber risks and threats, and aligning them to business objectives, they are able to take the appropriate measures to protect their digital assets and maximise the opportunities available online.

The question lessors have asked is, how can I implement cyber resilience in practice?

Cyber resilience is a process of continual refinement and relies on organisations understanding the quantity, sensitivity and location of the assets to protect. The new GDPR, effective from 25 May 2018, has mandated this approach to information asset management on EU citizens' personal information. Our experience with aviation-leasing clients in implementing processes to support GDPR highlighted the effort

required to meet basic compliance; but the result, a much stronger position with regard to their data management and protection of information assets. A similar approach to cyber resilience is required.

Our message to clients is that cyber security is a number of things executed effectively, so where can I start, or continue the journey to cyber resilience?

As a starting point, board members should consider the following areas of focus – a number of steps can be taken with minimal incremental cost, beginning with a cyber-focused risk assessment:

- **identify critical assets** – both key systems and information assets. It is essential to understand what we are trying to protect and make investment decisions on cyber defence based on the most critical assets;
- **risk assessment**. A risk assessment will help to understand how the threats to our assets are managed and identify/prioritise further mitigating actions, while ensuring ongoing focus on the issue at board level. For key systems and information assets, consider the arrangements in place over access, backup, technical support, business continuity and protection against attack. Consider who might be interested in disrupting these systems, or stealing your data. An informed risk assessment will help build effective defences. Data leakage via hacking, phishing and other social engineering attacks would provide a criminal gang the capability to misrepresent your company – allowing them to change standing financial data such as bank account details, thereby redirecting legitimate payments or creating fictional invoices against your assets;
- **incident response**. Consider how critical identified key systems are to your business and, in the event of an attack or disruption, how quickly you would seek to restore them – critical systems should be prioritised. Develop (and test) an incident response plan, which can be enacted in the event of an attack. This will help to ensure that the appropriate personnel (within the organisation and outsourced technical support) are quickly engaged, and that priority is given to isolation (and restoration) of key systems. The minutes and hours after an event are critical – be prepared;
- **review your own general IT control environment**. From maintaining up-to-date policies and procedures, through to regularly reviewing access and user rights to the network and key applications. Consider limiting the use of removable media – all laptops and removable media should be encrypted and regularly scanned for malware;
- **staff awareness**. Staff are a critical element of cyber defence, particularly in relation to attempts at cyber fraud or theft, phishing, data theft or corruption or transmitting malware. Ensure they understand corporate policies covering acceptable and secure use of IT equipment. Encourage them to think twice before opening an unsolicited email attachment, or acting on unusual requests (even if they appear to be from senior management);
- **network security**. Seek support from IT specialists to ensure robust network access protocols (including user/device authentication) and defence, such as firewall, antivirus and antimalware. All systems and networks should be continuously monitored for unusual activity or attempted/actual attacks;
- **system updates and security patches**. Ensure that system software updates and security patches are processed as they become available. These are often issued by software providers to address known vulnerabilities or threats. Cyber attackers often exploit known system vulnerabilities – timely application of system updates is essential;
- **data management**. Cyber attacks often target company data, either to corrupt it, steal it, or demand a ransom. The GDPR (effective May 2018) has heightened awareness of the importance of robust data management and places a significant additional burden on companies in relation to any personal data they hold. All companies should take stock of their data management policies, procedures and processes (and, indeed, only hold essential data), and reinforce controls to ensure secure data storage; and
- **use of cloud-based services**. Many companies are choosing to outsource their systems and data to third parties. While this has many potential benefits, care should be taken to obtain assurance from third-party providers (with their obligations being embedded within contracts), particularly with regard to business continuity, security of systems and data, and timely reporting of any attempted security attacks.

With a clear understanding of how resilient your company is, then the process of creating gamified scenarios and expected outcomes becomes much clearer. Companies can focus on what the true risks are to their business and not get distracted by the noise surrounding many of the daily cyber incidents reported in the media.

At KPMG, we define cyber resilience in six core interdependent domains when delivering cyber security services to our clients:

- cyber governance;
- privacy management;
- asset management;
- access management;
- technical control; and
- incident response.

With the right governance structures and processes, information and appliance asset management, identity access management for customers and staff, technical measures to protect network boundaries and gateways, and response plans that are effective when needed, an organisation can consider itself to be resilient in the face of cyber risk.

Threat to aviation-leasing companies

- aviation-leasing companies are a high value target for cyber criminals because of the scale of financial transactions, and the rewards from compromising these transactions (even on a one-off basis) are quite lucrative;
- using gamification can help to identify your core assets, increase cyber security awareness and engage staff on the subject;
- the typical reaction is to throw money at the problem, unfortunately after an attack
  – not the correct approach and should be considered as part of an overall risk-based approach
  – it is easier to budget for deterrence, the costs of remediation after an incident are unknown and likely to escalate quickly;
- a lot of good work has been done to implement General Data Protection Regulation and it provides a strong data management policy on which to build cyber resilience;
- increased delivery of services via digital channels requires security by design and default; and
- the minutes and hours after an incident are critical. Have a well-designed and tested response plan.

New partners – new markets

In the hope of bolstering sales of their newest products, Bombardier has linked up with Airbus, while Embraer is looking to Boeing. **Geoff Hearn** gets some views on which manufacturers will gain the most from the tie-ups.

The world of aircraft manufacturing looks set to be a very different place by the end of 2019. The effective absorption of Bombardier's flagship civil aircraft programme by Airbus, and Boeing's impending tie up with Embraer, means the big two manufacturers will effectively control production of all western-built commercial jet aircraft.

Among the many changes will be a realignment in the long-standing and often acrimonious rivalry between Bombardier and Embraer. The competition between the CSeries, rebranded as the Airbus A220, and the larger Embraer E2 models will form part of a wider battle between Airbus and Boeing products, although Bombardier and Embraer will retain a keen interest in the outcome in the 100- to 150-seat market. Embraer's welcoming in mid-December of Brazil's written filing to the World Trade Organisation over alleged Canadian government subsidies to Bombardier is a sign that direct hostilities continue.

A recent announcement by Boeing and Embraer seems to dispel any doubts that they will team up with a view to competing more effectively against the A220. The companies confirmed on 17 December that a strategic partnership had been approved. The terms define a joint venture comprising the commercial aircraft and services operations of Embraer, in which Boeing will take an 80% stake and the Brazilian manufacturer will hold the remaining 20%. However, the transaction remains subject to government, regulatory and shareholder approvals.

The agreement looks as if it will leave Embraer's marketing team much more involved than appears to be the case for their Bombardier counterparts in the tie up with Airbus. The recent announcement confirms: "Once the transaction has closed the commercial aviation joint venture will be led by Brazil-based management, including a president and chief executive officer."

There is a view that the Airbus philosophy may have advantages. Its sales team is more accustomed to dealing with mainline airlines, which, so far, have been responsible for the largest orders of the A220.

The Boeing-Embraer deal is, in any case, a long way behind the Airbus-Bombardier agreement, which was finalised on 1 July 2018. Airbus now owns a 50.01% majority stake in CSeries Aircraft Limited Partnership, while Bombardier and Investissement Québec own about 34% and 16%, respectively.

Embraer E195-E2

Airbus is already focusing on increasing production of the A220s. As part of the deal, the European manufacturer is expanding the production line in Mobile, Alabama, to produce up to four A220s a month from 2020. However, the main production line will remain in Mirabel, Québec, where Airbus has started construction of two new buildings that will enable the company to boost the build rate of A220s. Before Airbus's acquisition of the programme, Bombardier executives talked of hiking production to between 90 and 120 aircraft annually by 2020, but rates have remained well below these levels since the aircraft entered production.

Despite the protestations of JetBlue that the Airbus takeover was a secondary factor in its ordering of 60 A220-300s, the large order was a big early boost to the new-look programme and a significant blow to Embraer, given the New York-based carrier operates a large fleet of first-generation E190s and the Brazilian manufacturer had high hopes of winning the contest. The order was officially confirmed at the end of December at the same time as Airbus announced that JetBlue founder, David Neeleman, ordered 60 A220-300s for his latest project, start-up US carrier Moxy.

JetBlue says the contest was very close but the A220 won out on economics and fleet-plan flexibility. The airline says that both the A220 and the E195-E2 models provide a step change from existing technology and the carrier estimates that the A220 will lower operating costs by 29% on a per-seat basis when compared with its existing E190 fleet.

The JetBlue order is a major factor in the lead that the A220 has established over its Embraer rivals in terms of order numbers.

Key data

A220-100/-300 and E190-E2/E195-E2

Model	A220-100	A220-300	E190-E2	E195-E2
Maximum seats	133	160	114	146
Typical seats	108	140	106	132
Range (nm/km)	3,100/5,740	3,300/6,110	2,850/5,280	2,600/4,800
Entry into service	2016	2016	2018	2019
Total orders	78	345*	63	115
List price 2018 ($m)	81	91.5	59.1	66.6

Source: Airfinance Journal research
**includes Moxy order for 60*

The A220 models have more than double the order backlog of the E190-E2/E195-E2 and also double the number of customers.

Embraer is picking up orders such as Azul's recent confirmation of its 2018 Farnborough order for 21 E195-E2s. In the third quarter, Swiss carrier Helvetic Airways signed a firm order for 12 E190-E2s and Binter in Spain ordered three E195-E2s. However, the Brazilian manufacturer has not achieved a breakthrough with a major US carrier in a market where its smaller first-generation E175 has been so successful. Although not a direct competitor to the A220, delays to the E175-E2 programme are a setback to the overall success of the E2 family.

Gueric Dechavanne, vice-president, commercial aviation services, Collateral Verifications, is bullish on the Airbus/Bombardier deal and believes the Boeing/Embraer collaboration makes sense as a riposte.

"Airbus will do well with the acquisition of the CSeries programme as it is now able to offer a full array of products from 100-seat to 500-seat aircraft. From the market standpoint, I believe that having Airbus on board creates a sense of stability and reliability not only from the product support and marketing but also for their ability to manufacture enough aircraft to satisfy the market demand. I also believe that Airbus may be able to take advantage of the technology developed for the A220 and apply it to the next generation of the A320 family when the time comes."

He adds: "Based on this, it was only logical for Boeing to respond with the potential acquisition of the E-Jet programme so that they can offer the same range of products when competing in airline campaigns. It is not necessarily apples to apples in terms of the products they are able to offer, as I believe the E2 still falls a bit short in terms of capacity and range over the A220, but it will allow them to compete in campaigns that require 100-seat aircraft and up."

Collateral Verifications puts a higher value on the E195-E2 than on either of the A220 variants. However, Dechavanne cautions that there is not a lot of transaction data available, which makes valuing the assets difficult. He says: "Although the pricing on the E2 is higher then the A220-300, I believe this will change as more A220s get delivered and the market feels more comfortable with the asset."

Olga Razzhivina, senior Istat appraiser, Oriel, sees pros and cons in both the tie-ups. She points out that Airbus has seen the smallest members of its single-aisle family lose popularity with the A318 and the A319neo suffering from being shrunk versions of optimised larger products – making them relatively heavy and inefficient. The A220 models bring optimal designs for their size category to the Airbus product range.

Airbus A220 first take off

Razzhivina says: "On one hand, joining the Airbus family is a positive for the A220, which has been suffering with the market having apprehensions about Bombardier's longevity in the sector. On the other hand, the A220 lacks commonality with other Airbus products. This aspect is particularly important to the increasingly significant low-cost carrier market, which looks at fleet commonality as one of the cornerstones of cost saving. Overcoming this drawback would take a significant investment from Airbus and would result in reduced commonality with existing generations of aircraft. Given that the average size of single-aisle aircraft has been steadily growing, Airbus's attention is more likely to be concentrated on the A321, rather than its new acquisition."

There are some parallels between Boeing and Airbus, when it comes to the smaller products in their single-aisle families. The 737-600's lack of success is being replicated by the 737 Max 7's sparse orderbook. The E195-E2 could help in addressing the weight and efficiency issues in the same way that the A220 helps the Airbus family. Like the Airbus situation, the E-Jet family would not have fleet commonality with Boeing's existing narrowbodies, but unlike the A220, it has an established market base.

Razzhivina sees some problems for the Embraer models. "Like the A220, the E2 has not been able to garner a large number of orders, partly because the lower-than-anticipated fuel price makes new technology less attractive, particularly in markets where sector lengths are short. Although not as significant in the E195-E2-size category as they are for the E175-E2, pilot scope clauses may hinder sales in the US, which is a hugely important market for Embraer's second-generation family. Boeing is unlikely to be able to influence this aspect of the US landscape."

The A220 and E2 models represent a level of new technology that will be the market standard for some decades; however, both products need to see more orders to establish themselves as mainstream products. Razzhivina notes that whether the models avoid becoming niche products depends to a large extent on factors such as fuel price and pilot shortages, which are beyond the control of Airbus and Boeing. Nonetheless, Bombardier and Embraer will be hoping their chosen partner is the most effective in maximising sales of their new-technology designs.

Values

Market values 2018 vintage ($ million)

	A220-100	A220-300	E195-E2
CV view	29.2	35.0	39.0
Oriel view	36.9	42.3	34.9

Indicative lease rates ($000/month)

	A220-100	A220-300	E195-E2
CV view	235	280	295
Oriel view	280	305	255

First family members compete for market share

Many airlines are moving to larger single-aisle aircraft, but the baseline Airbus A320neo and the Boeing 737 Max 8 are still the most-sold models. **Geoff Hearn** looks at which manufacturer has the upper hand in the size category.

Boeing and Airbus between them have sold well over 11,000 of their new-generation single-aisle models but the rivalry between the two manufacturers remains as intense as ever because they each claim to have the best of the new-technology aircraft.

For the previous generation of single-aisle aircraft, the core competition was between the Airbus A320 and the Boeing 737-800, albeit that the A321 started to make inroads as airlines began switching to larger models.

Despite the emerging trend to larger aircraft, both Airbus and Boeing chose to make the successors to the A320/737-800 the launch models of their next-generation aircraft. The battle between the A320neo and the 737 Max 8 therefore remains key to which manufacturer wins the contest for market share. The current orderbooks back up the importance of the launch models, which account for 64% of Airbus's Neo orders and for 79% of Boeing's sales of Max aircraft.

Both the A320neo and the 737 Max 8 are in airline service, although the aircraft they replace continue to be built and ordered. The level of deliveries of the previous generation has been sustained by problems with the introduction of the new models, but the tailing-off has begun. Obtaining a definitive position from the manufacturers of the phase out is difficult, but *Airfinance Journal*'s Fleet Tracker shows firm delivery slots in 2019 for only about 20 current-generation A320s and about 40 slots for 737-800s. However, delivery numbers may increase if the introductory problems of the new-generation models continue.

A320neo

The A320neo (new engine option) is the first member of Airbus's upgraded and re-engined single-aisle family. The baseline A320neo has a choice of two new-generation engines (the PurePower PW1100G-JM from Pratt & Whitney and the Leap-1A from CFM International). The aircraft also features fuel-saving wingtip devices known as sharklets, which are also available on later models of the A320.

Airbus A320neo

Boeing 737 Max 8

The respective engine manufacturers claim that their engines offer a fuel saving of about 15% compared with their equivalent predecessors. Initial in-service experience has borne out that there are substantial fuel savings but the overall advantage of the new models looks to be between 11% and 12%.

Improvements to fuel burn are an on-going process and Pratt & Whitney, for example, has promised a further 2% improvement for models delivered in 2019. However, the manufacturer is heavily investing engineering resources to fix the various issues experienced since entry into service and this may detract from the development of further fuel-saving technologies.

737 Max 8

The 737 Max 8 replaces the 737-800 Next Generation (NG). As with the NG family, Boeing has opted to go with CFM as a single source engine supplier, selecting the Leap-1B engine as the sole powerplant option. The first 737 Max 8 entered service in May 2017.

The 737 Max 8 offers additional range of about 400 nautical miles (740 km) compared with the 737-800. The Max family aircraft are all equipped with Boeing's Sky Interior, which was introduced as an option on NG models in 2010.

Boeing launched the 737 Max 200 – a high-density variant of the 737 Max 8 – in September 2014. The programme was based on a requirement of launch customer Ryanair, but Boeing says it developed the 737 Max 200 in response to the needs of the fast-growing low-cost sector, which the US manufacturer forecasts will account for 35% of single-aisle airline capacity by 2033.

Early reports from US carriers suggested that the 737 Max 8 was meeting or exceeding fuel burn expectations with a 14% advantage over the 737-800. CFM's Leap engine has had issues since entry into service, but they have been less severe than those on the PW1100 engine and have had more impact on the A320neo fleet than on 737 Max aircraft.

Key data

A320neo versus 737 Max 8

Model	A320neo	737 Max 8
Maximum seats	194	210
Typical seats	150-165	162
Range (nm/km)	3,750/6,950	3,510/6,510
Entry into service	January 2016	May 2017
List price ($m) 2018	108.4	112.4

Source: Airfinance Journal research

Orders

Although, as launch models, the A320neo and 737 Max 8 account for the majority of orders for their respective families, there are signs that the market's centre of gravity is shifting. Last November, India's Indigo Airlines switched 125 of its existing A320neo orders to the larger A321neo model. This and other transactions are reflected in a diminishing orderbook for the baseline A320neo as A321neo sales have accelerated over the past six months.

There is evidence of a similar trend for the Boeing models. In July, Brazilian carrier GOL Airlines signed a contract that converts 30 of its Max orders to the Max 10 variant and, in November, Virgin Australia swapped orders for 10 of its Max 8s to the larger variant. However, the orderbook for the Max 8 is still increasing and some of the switches can be attributed to the relatively recent launch of the Max 10.

These trends make it difficult to judge the success of individual models. A direct comparison of the A320neo and 737 Max 8 orderbooks shows an advantage for the Airbus model, but this would be expected given its earlier entry into service. Since its launch the Max 8 has outsold its rival, which is a similar trend to the one seen in the competition between the A320 and the 737-800. The trend is compounded as A320neo orders are reduced by switches to the A321neo. The combined sales of the 737 Max and Max 200 are now barely 100 fewer than the A320 figure.

The overall picture appears significantly to favour Airbus, which has a lead of more than 1,400 aircraft if sales of the complete families are considered. This lead has, however, slightly reduced over the past six months.

Seating

Despite both manufacturers having larger models to offer, both are pushing high-capacity configurations of their baseline single-aisle models. Airbus, in particular, has steadily increased the maximum capacity of the A320, which now stands at 194 – 14 seats more than the original A320's maximum capacity.

Indicative relative cash operating costs (COC)

	737-800	A320-200	A320neo	737 Max 8
Relative trip cost	101.9%	Base	93.2%	96.2%
Relative seat cost	94.3%	Base	93.2%	89.1%

Indicative relative total direct operating costs (DOC)

	737-800	A320-200	A320neo	737 Max 8
Relative trip cost	101.5%	Base	101.4%	106.1%
Relative seat cost	94.0%	Base	101.4%	98.2%

Assumptions: 500 nautical-mile sector, fuel price $2.20 a US gallon. Fuel consumption, speed, maintenance costs and typical seating layouts are as Air Investor 2019. Capital costs are based on 2018 list prices.

The manufacturer also quotes a "typical" seating figure of 165, which is 15 seats more than a widely held view that the A320 is a 150-seat aircraft. The definition of typical is somewhat vague, but the increase between generations reflects that airlines are increasingly taking higher density versions. This trend is driven by the increasing presence of low-cost carriers and by the growing importance of Asian carriers. Both of these groups tend to operate higher density versions of aircraft than is the case for legacy European and US carriers.

Boeing is also pushing higher seating capacities with its marketing material showing the 737 Max 8's maximum capacity as 210 seats. These maximum capacities have been regarded as somewhat academic when making comparisons between models, but the trend to higher densities makes a comparison of absolute maximums relevant for some airlines. Airbus believes more than 50% of future A320 deliveries will be aircraft with more than 180 seats.

There is no doubt that the 737 Max 8 has a larger cabin than the A320, but it is not necessarily the case that all of this advantage can be translated into a seating advantage, and Airbus has proved adept at squeezing more seats without recourse to major design changes akin to the introduction of additional emergency exits that are required for the Max 200. There is also a widely held acceptance that the A320's cross section provides more space than the 737, although judging by sales of previous generation aircraft this has not been a major negative for the Boeing aircraft.

Operating cost

Airfinance Journal has carried out its own analysis of operating costs based on information released by the manufacturers. For the purposes of this analysis, the generally accepted 12-seat advantage for the 737-800 over the A320 is maintained for the baseline comparison of the A320neo with the Max 8. Given they are not intrinsically larger, the new-generation models are not credited with additional seating compared with their predecessors.

The analysis confirms that the relative costs of the Max 8 and the A320neo are closely matched and follow a similar pattern to the differences that *Airfinance Journal* has previously found in comparisons between the 737-800 and A320. The Max 8 costs about 3% more per trip to operate than the A320neo, which equates to a seat-cost advantage of about 5% for the Boeing model.

The *Airfinance Journal* analysis consistently shows lower savings for the new-generation models over their predecessors, compared with the figures presented by the respective manufacturers. However, with fuel prices back over $2 a US gallon, the case for the Neo and Max is becoming more compelling.

It remains to be seen whether the manufacturers' claims on maintenance costs are borne out, but given the in-service problems of the new engines, it seems unlikely they will deliver the promised savings in the short term. The consolation for airlines is that the increased maintenance costs will largely be borne by the manufacturers because most engines are enrolled in all-inclusive flight-hour packages.

Total orders for Neo and Max families

Type	Orders
A319neo	53
A320neo	4,017
A321neo	2,221
Total Neo	**6,291**

Type	Orders
737 Max 7	65
737 Max 8	3,806
737 Max 200	110
737 Max 9	310
737 Max 10	537
Total Max	**4,828**

Source: Airfinance Journal Fleet Tracker December 2018

WE'VE EXPANDED, SO YOU' CAN TOO.

WE MAKE IT FLY

Introducing two clever ways to grow your business. The A220-100 and A220-300 are the newest members of our single aisle family – covering the market from 100 up to 240 seats and flying up to 4,000nm. And with the very latest in cabin ergonomics your passengers will be as comfortable as your profit margin.

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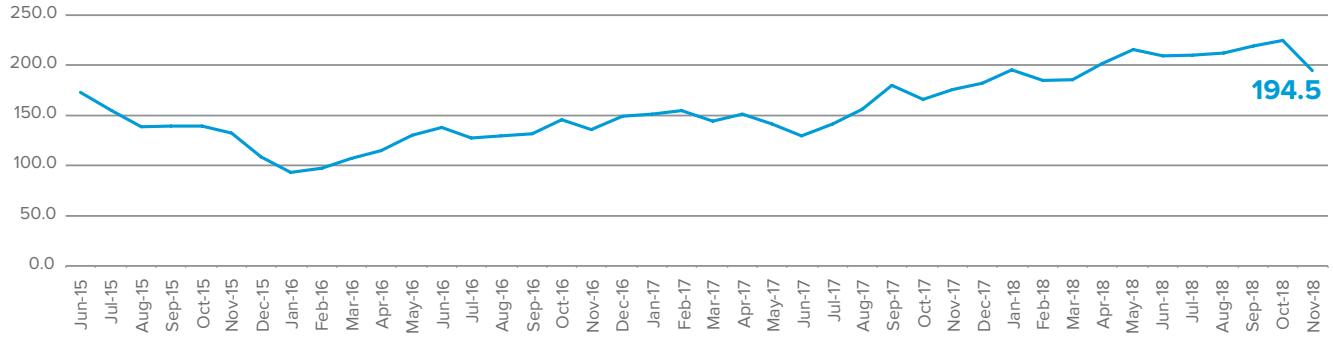
US Gulf Coast kerosene-type jet fuel (cents per US gallon)



Source: US Energy Information Administration

Commercial aircraft orders by manufacturer

	Gross orders 2019	Cancellations 2019	Net orders 2019	Net orders 2018
Airbus (9 January)	200	0	200	747
Boeing (8 January)	0	0	0	893
Bombardier	0	0	0	26
Embraer	0	0	0	155
ATR	3	0	0	16

Based on *Airfinance Journal* research and manufacturer announcements until 10/01/19

Recent commercial aircraft orders (November 2018-January 2019))

Customer	Country	Quantity/Type
jetBlue	USA	60xA220-300
Moxy	USA	60xA220-300
ICBC Leasing	China	80xA320 family
Aurigny	UK	3xATR72-600
CALC	Hong Kong	50x737 Max
Azul	Brazil	21xE195-E2
Air Kiribati	Kiribati	2xE190-E2
MEA	Lebanon	4xA330neo
BOC Aviation	Singapore	2xA350-900; 3x777-300ER
Avation	Singapore	8xATR72-600
Republic	USA	100xE175
Avolon	Ireland	100xA320neo
Nordic Aviation Capital	Denmark	3xE190
SaudiGulf	Saudi Arabia	10xA320neo
Delta Air Lines	USA	10xA330-900
Turkish Airlines	Turkey	3x777-200F
RAM	Morocco	1xATR72-600
Jeju Air	South Korea	40x737 Max 8
easyJet	UK	17xA320neo
American Airlines	USA	15xE175
SPDB Financial Leasing	China	40xARJ21
VietJet	Vietnam	50xA321neo
Vistara	India	6x787
Vistara	India	13xA320neo

Based on *Airfinance Journal* research up to 09/01/2019

Aircraft list prices - new models

Model	$ million
Airbus (2018)	
A220-100	81
A220-300	91.5
A319neo	99.5
A320neo	108.4
A321neo	127
A330-800neo	254.8
A330-900neo	296.4
A350-900	317.4
A350-1000	359.3
Boeing (2018)	
737 Max 7	96
737 Max 8	117.1
737 Max 9	124.1
737 Max 10	129.9
777-8X	394.9
777-9X	425.8
787-10	325.8
Embraer (2018)	
E175-E2	51.6
E190-E2	59.1
E195-E2	66.6

As of 10/1/2019

Rating agency unsecured ratings

Airlines

	Fitch	Moody's	S&P
Aeroflot	BB-(stable)	-	-
Air Canada	BB-(pos)	Ba2(stable)	BB(pos)
Air New Zealand	-	Baa2(stable)	-
Alaska Air Group	BBB-(stable)	-	BB+(stable)
Allegiant Travel	-	Ba3(stable)	BB-(stable)
American Airlines Group	BB-(stable)	Ba3(stable)	BB-(stable)
Avianca - IFRS	B(stable)	-	B(stable)
British Airways	BBB-(stable)	Baa3(stable)	BBB-(stable)
Delta Air Lines	BBB-(stable)	Baa3(stable)	BBB-(stable)
Easyjet	-	Baa1(stable)	BBB+(stable)
Etihad Airways	A(stable)	-	-
Gol	B(stable)	B2(stable)	B-(stable)
Hawaiian Airlines	BB-(stable)	Ba3(stable)	BB-(stable)
Jetblue	BB(pos)	Ba1(stable)	BB(stable)
Latam Airlines Group	B+(pos)	Ba3(stable)	BB-(stable)
Lufthansa Group	-	Baa3(stable)	BBB-(pos)
Qantas Airways	-	Baa2(stable)	-
Ryanair	BBB+(stable)	-	BBB+(stable)
SAS	-	B1(stable)	B+(stable)
Southwest Airlines	BBB+(pos)	A3(stable)	BBB+(stable)
Spirit Airlines	BB(neg)	-	BB-(neg)
Turkish Airlines	-	Ba3(neg)	B+(stable)
United Continental	BB(stable)	Ba2(stable)	BB(stable)
US Airways Group	-	-	-
Virgin Australia	-	B2(stable)	B+(stable)
Westjet	-	Baa3(neg)	BBB-(neg)
Wizz Air	BBB(stable)	Baa3(stable)	-

Source: Ratings Agencies - 9th January 2019

Lessors

	Fitch	Moody's	S&P	Kroll Bond Ratings
AerCap	BBB-(stable)	-	BBB-(stable)	-
Air Lease	BBB(stable)	-	BBB(stable)	A-(stable)
Aircastle	BBB-(stable)	Baa3(stable)	BBB-(stable)	-
Avation	BB-(stable)	-	B+(pos)	-
Aviation Capital Group	BBB+(pos)	-	A-(stable)	A(stable)
Avolon	BB(pos)	Ba1(stable)	BB+(stable)	BBB+(stable)
AWAS Aviation Capital	-	Ba2(stable)	BB+(stable)	-
BOC Aviation	A-(stable)	-	A-(stable)	-
Dubai Aerospace Enterprise	-	Ba1(stable)	BB+(stable)	-
Fly Leasing	-	Ba3(neg)	BB-(stable)	BBB(stable)
ILFC (Part of AerCap)	BBB-(stable)	Baa3(stable)	-	-
Park Aerospace	BB(pos)	Ba2(stable)	-	-
SMBC Aviation Capital	A-(stable)	-	A-(stable)	-

Source: Ratings Agencies - 9th January 2019

Manufacturers

	Fitch	Moody's	S&P
Airbus Group	A-(stable)	A2(stable)	A+(stable)
Boeing	A(stable)	A2(stable)	A(stable)
Bombardier	B-(stable)	B3(stable)	B-(stable)
Embraer	BBB-(stable)	Ba1(stable)	BBB(stable)
Rolls-Royce	A-(stable)	A3(neg)	BBB+(neg)
United Technologies	-	Baa1(stable)	BBB+(neg)

Source: Ratings Agencies - 9th January 2019

Speed and the question of **first-class travel**

In the second part of two columns, **Adam Pilarski**, senior vice-president at Avitas, argues that it will only be a matter of time before passengers are paying more to travel by supersonic aircraft.

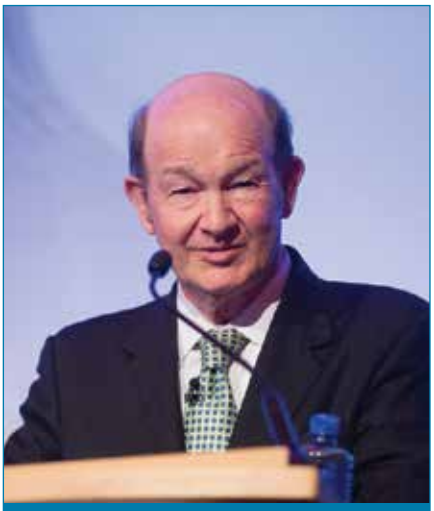
In last month's column, I wrote about the progress experienced in aviation when, after the miracle of flight, humans' talents moved towards safety, distance and comfort. The initial aviators were dreaming of huge aircraft. Gianni Caproni, the Italian aviation pioneer, talked about an aircraft carrying 100 passengers barely 10 years after the initial Wright brothers' flight and, in 1929, the Dornier DoX actually flew 169 people, similar to the average seat-count in service today.

The dreams were all about speed and size. But, for more than 60 years since the introduction of jets, the goal of aircraft designers has been that of increased efficiency in order to give the masses the opportunity to fly. Currently, it looks like much of the progress that has been achieved by airlines lowering costs of flying is levelling off. We fly vast populations in safety but at 1950s' speed.

A new source of future growth could be in increased speed, especially since the world's wealth is rising constantly and a larger part of the population will be able to afford faster, though more expensive, travel. Boeing was recently in the news with talk of hypersonic passenger commercial aircraft. These would fly at speeds of Mach 5, allowing intercontinental flights (Atlantic and Pacific too) making a one-day business trip between continents feasible in about two hours.

Such aircraft are seen as flying in the more distant future, at least 20 years ahead. Other attempts may come to fruition in a shorter timeframe relying on supersonic technology. US supersonic jet company Boom Technology has the support of Virgin Atlantic, and JAL talks about a 50-seater flying in 2023 at a speed of Mach 2.2. There are attempts by Lockheed, Airbus and, separately, by the Chinese to fly supersonic in the next few years. So there is a lot of interest in reviving Concorde, which was grounded in 2003.

Improvements in aircraft can be seen as either affecting everybody on board uniformly or improving the experience for select passengers. When an aircraft experiences less turbulence, every passenger benefits the same way. On the other hand, efficiency improvements allowing more space per passenger can be monetised by charging some passengers more in first class. The question is whether airlines will be able to get a premium for speed because everybody arrives at the destination simultaneously on the same aircraft. So the question is: will we have aircraft flying supersonic versus regular flights and what should the price differential be?



Our author at the 19th Global Annual Airfinance Conference in Dublin.

> *"US supersonic jet company Boom Technology has the support of Virgin Atlantic, and JAL talks about a 50-seater flying in 2023 at a speed of Mach 2.2"*
>
> **Adam Pilarski**, senior vice-president, Avitas

Concorde was not a very successful product – only 14 were sold. With the 1973 ban on overland supersonic flights in the US, because of concerns with the sonic boom, its market was limited. Also, it was not a very good aircraft. Its range was limited and it had poor operating economics while also not providing the level of luxury desired by those paying high-ticket prices. With the technological progress made over the past half a century, we may come up with a product capable of flying supersonics within the environmental constraints society will demand.

High speed will come at a price, which, by definition, will lead to higher fares. An important question is: how much are people willing to pay for quicker flights (value of time)? When designing Concorde, some research done by economists assumed (standard economics) that a person's time was worth the value of foregone earnings (meaning hourly wages). The initial calculations postulated 150% value for Concorde passengers, later reduced to 100%. All this was very interesting but the pragmatic approach triumphed and assumed that people would be willing to pay the equivalent of a business fare on regular flights for an economy service on faster flights.

So, paying more to fly faster up front can have two reasons: the traditional higher luxury (beds, sauna, sushi chef) or savings of time meaning saving money. So what will happen to the new supersonic aircraft? To me, it is obvious that in the past few years we have made tremendous advances in ways to deal with the sonic boom and the existing regulations will eventually be overturned. Will we be able to separate the passengers into those willing to pay more for less travel time on separate new aircraft and relegate the back of the bus to flying the traditional subsonic jets while possibly still differentiating service levels by fare class?

In my opinion, this will not work because those up front still want to feel special and superior to others. This is why all business class-only flights do not work. We will definitely move towards supersonic aircraft. At first, with only one (very expensive) class but soon, as average incomes rise, the population will fly on supersonic aircraft with different service levels – the same way colour TV eventually replaced black and white or jets replaced turboprops.

AIRFINANCE JOURNAL

An ***Airfinance Journal***

special supplement

Air Investor 2019

Widebodies lose further ground with investors

Airfinance Journal analyses the industry's favourite aircraft and reviews the impact of the new-technology options on the current-engine jets.

Investors' appetite clearly remains in mainstream aircraft. Few investors venture outside the most popular types of narrowbody and widebody aircraft: the Airbus A320 and Boeing 737/Max families and the 787/A350s.

Of the top 10-favoured aircraft in 2018, the first six were narrowbodies. Five years ago, the favoured model was the 777-300ER and the top six included three narrowbodies (737-800/Max 8/A320neo), as well as three widebodies (777-300ER/787-9/A350-900).

The current environment continues to favour current-technology narrowbody aircraft. In 2018, the A320neo-family aircraft was still subject to delays because of engine issues, affecting monthly production rates. Oil prices globally remained at reasonable levels, making a viable case for current-technology aircraft.

This is why the likes of the 777-300ER, A330-300 or even 767-300ER are still mixed up with new-technology widebodies in the charts.

Narrowbodies

The first A320neo aircraft are entering their third year of service, while the Max 8s are now more than 18 months in service.

Despite Airbus and Boeing increasing production rates, it remains unclear when and how residual values for the current-technology aircraft will be impacted. What is certain, given the backlog of orders for the Neo and Max versions, is that the impact on current-technology aircraft continues not to be felt immediately.

Over the past year, second-hand 737-800s have been placed rapidly and demand has been strong. Start-up carriers continue to source eight- to 10-year-old aircraft before committing to newer models.

As a result, the 737-800 model continues to top the charts in *Airfinance Journal*'s Investors' poll.

One leasing company said aircraft trading for the 737-800 model is at a premium and lease rates for newer aircraft are close to the Max 8.

"Some airlines prefer next-generation aircraft to Max at the moment and due to ongoing issues," says the leasing company source.

Airbus A320neo

The 737-800 remains among the most remarketable assets but competition makes it hard to access for value, says another leasing source.

The A321neo claimed the top spot for residual values, narrowly beating the 737-800. The poll shows the Airbus model scored 4.52. The 737-800, which first delivered in 1998, scored 4.48.

Single-aisles

Aircraft type	Residual value	Value for money	Operational success	Remarketing potential	Overall score	Last year's score	Difference
737-800	4.48	4.12	4.95	4.73	4.57	**4.58**	-0.01
A321neo	4.52	4.20	4.06	4.74	4.38	**4.49**	-0.11
A320	4.00	4.04	4.86	4.52	4.36	**4.36**	0.00
737 Max 8	4.33	4.16	4.21	4.58	4.32	**4.29**	0.03
A320neo	4.45	3.90	3.88	4.74	4.24	**4.30**	-0.06
A321	4.12	4.08	4.48	4.35	4.26	**4.13**	0.13
737 Max 10	3.75	3.79	n/a	3.87	3.80	**3.85**	-0.05
A220-300	3.29	3.53	3.71	3.19	3.43	**3.55**	-0.12
737 Max 9	3.28	3.50	3.58	3.35	3.43	**3.17**	0.26
737-900ER	2.91	3.37	3.50	2.86	3.16	**3.29**	-0.13
737-700	2.85	3.22	3.60	2.56	3.06	**3.22**	-0.16
A319	2.65	3.10	3.56	2.57	2.97	**3.27**	-0.30
737 Max 7	2.50	2.79	n/a	2.35	2.55	**2.81**	-0.26
A319neo	2.35	2.54	n/a	2.00	2.30	**2.60**	-0.30
737-600	1.29	1.73	1.77	1.38	1.54	**1.98**	-0.44

Regionals

Aircraft type	Residual value	Value for money	Operational success	Remarketing potential	Overall score	Last year's score	Difference
ATR72-600	3.17	3.32	3.92	3.19	3.40	**3.37**	0.03
Q400	3.03	3.09	3.73	3.03	3.22	**3.34**	-0.12
ATR72-500	2.86	3.31	3.67	2.71	3.13	**3.19**	-0.06
CRJ900	2.92	2.92	3.42	2.92	3.04	**3.23**	-0.19
E175	2.60	2.92	3.64	3.00	3.04	**3.24**	-0.20
A220-100	2.63	3.00	3.23	2.67	2.88	**2.82**	0.06
ATR42-500	2.71	3.00	3.08	2.67	2.87	**2.89**	-0.02
ATR42-600	2.85	2.71	2.96	2.83	2.84	**2.89**	-0.05
E190	2.34	2.84	3.59	2.53	2.83	**3.24**	-0.41
E190-E2	2.69	2.70	2.67	2.67	2.68	**3.40**	-0.72
E195-E2	2.67	2.79	n/a	2.54	2.66	**3.11**	-0.45
E195	2.22	2.80	2.79	2.31	2.53	**3.08**	-0.55
CRJ700	2.38	2.33	2.75	2.33	2.45	**2.77**	-0.32
CRJ1000	2.31	2.63	2.67	1.92	2.38	**2.54**	-0.16
E175-E2	2.15	2.29	n/a	2.08	2.18	**3.11**	-0.93
CRJ200	1.69	2.00	2.83	2.08	2.15	**2.56**	-0.41
E170	2.00	2.08	2.42	2.00	2.13	**2.63**	-0.51
ERJ145	1.50	2.00	2.85	1.77	2.03	**2.24**	-0.21
MRJ	1.62	2.04	n/a	1.64	1.76	**2.27**	-0.51
SSJ100	1.15	1.79	1.25	1.17	1.34	**2.44**	-1.10

In comparison, the A320 remained unchanged at 4.00.

The gap between gets tighter when it comes to remarketing potential. The 737-800 scores 4.73 versus 4.52 for the A320. In 2017, the 737-800 scored 4.67 versus 4.36 for the A320 model.

Interestingly, demand for 737-700 part-out aircraft with engines is still high because of fewer -800 part-outs than expected, says a source.

The 737 Max 8's overall score this year was higher than last year, probably because more units delivered in 2018 compared with 2017, and the model gets more market acceptance.

The A320 remains popular but the A321 aircraft is the model that has shown the biggest progress over the past year. Its residual value is 6% up year on year, while value for money increased by 2%. Remarketing potential shows an increase of 5%. "Cargo conversion opportunity provides more residual support," says one trading source about the A321.

The market continues to be active in second-hand A319s, but the model is rivalled by new-technology aircraft such as the Embraer E195-E2 and A220-300.

Airbus new-technology aircraft remain penalised for their operational success (one of the four criteria in the poll).

The A320neo scores better than the 737 Max 8 in terms of residual values and remarketing potential but less in value for money and operational success.

"Most operators and financiers see the [predominantly Pratt & Whitney-driven] engine issues are short-term issues and thus any impairment in the type's popularity is likely temporary," observes one trader.

The A321neo is dominant in its segment and, as a result, scores higher than competition in three of the four criteria, perhaps highlighting the need for Boeing to address the 225-seat and above market with the New Midsize Aircraft later this year?

"A true competitor won't emerge for some time, though the Max 10 is promising," says one leasing source.

Regionals

The ATR72-600 reclaimed top spot in the regional aircraft market scoring 3.4 overall, a marginal increase over the previous year.

The turboprop is now a mature aircraft and will have more than eight years of service in 2019.

The first ATR72 variant delivered in October 1989. The Franco-Italian manufacturer had delivered 187 ATR72-200s, 365 ATR72-500s, as well as 448 ATR72-600s, when it reached 1,000 deliveries in July 2018.

As the aircraft penetrates more markets, lessors are still in this model. Nordic Aviation Capital remains the largest leasing company for ATR aircraft, but Avation continues to commit for the ATR72-600s.

The ATR72-600

The lessor recently exercised options for the type and confirmed interest in converting some of its backlog to the freighter version, which launched in November 2017 with a FedEx order.

New ATR sales activity in 2018 is expected to slow down and the manufacturer is unlikely to match the 2017 tally of 113 firm orders and 40 options.

But the year has been tough in the regional market and, in the eyes of the investors, the ATR remains a solid and stable programme when compared with the Bombardier Q products, which will be sold to Viking Air in 2019.

Bombardier's only jet performer, the CRJ900 model, is one of the highest-ranked regional jets in this year's poll with average residual value and value for money close to the Q400 turboprop.

The Embraer E175 ranked equally to the CRJ900, which reflects the battle between the two manufacturers in the North America market. The E175 beats the CRJ900 on remarketing potential, perhaps reflecting the higher percentage of second-hand activity.

Embraer introduced the E195-E2 and the E190-E2 models to service this year and both are expected to score better next year as the Brazilian manufacturer increases deliveries and reports more data on the in-service performance. However, its future may lie via a joint venture with Boeing.

Widebodies

The 787-9 aircraft was the clear winner in the twin-aisle category. Its notable market popularity significantly outstrips the other options, with the A350-900 trailing behind.

However, both scored less than previously, which reflects a certain malaise in the widebody market.

Still, the ubiquity of both among airlines makes it a tried-and-tested favourite of the investor community year after year.

Five years ago, when both aircraft entered service, the 777-300ER and the A330-300 topped the charts the same way.

The 777-300ER has expensive transition costs. "Too many aircraft available in the secondary market [with leases attached] and may face issues of having too many returning from lease [and thus requiring remarketing] in the coming few years," says one leasing source.

The A330-300, perhaps with not too many available in the second-hand market with leases attached, is the only widebody that scored higher in 2018 than in 2017.

The 767-300ER model is enjoying a resurgence in residual value and remarketabiltiy because of freighter demand according to one trader.

The Boeing 787-9 model topped the widebody category

Twin-aisles

Aircraft type	Residual value	Value for money	Operational success	Remarketing potential	Overall score	Last year's score	Difference
787-9	4.18	4.10	4.44	4.21	4.23	**4.34**	-0.11
A350-900	3.90	3.83	3.93	3.76	3.86	**4.17**	-0.32
787-8	3.44	3.56	3.54	3.24	3.45	**3.65**	-0.21
A330-300	3.04	3.33	4.06	3.15	3.40	**3.26**	0.14
767-300ER	3.11	3.13	3.93	3.29	3.37	**3.68**	-0.32
787-10	3.29	3.47	n/a	3.27	3.34	**3.67**	-0.33
777-9	3.15	3.67	n/a	3.15	3.32	**3.33**	-0.01
777-300ER	2.70	3.15	4.42	2.55	3.21	**3.38**	-0.18
A350-1000	3.18	3.27	3.30	2.93	3.17	**3.41**	-0.24
A330-900neo	2.94	3.40	n/a	2.88	3.07	**3.09**	-0.02
777-8	2.77	3.00	n/a	2.75	2.84	**3.04**	-0.20
A330-200	2.30	2.86	3.59	2.35	2.78	**2.89**	-0.12
A350-800	2.56	2.43	n/a	2.14	2.38	**2.80**	-0.42
A330-800neo	2.29	2.58	n/a	2.08	2.32	**2.42**	-0.10
777-200ER	1.80	2.33	3.00	1.50	2.16	**3.11**	-0.95
777-200LR	2.00	2.13	2.23	1.88	2.06	**2.60**	-0.54
747-400	1.50	2.06	3.47	1.18	2.05	**2.60**	-0.55
767-400ER	1.80	2.08	2.38	1.57	1.96	**2.13**	-0.17
A380	1.19	2.24	3.00	1.16	1.90	**2.08**	-0.18
747-8I	1.44	2.14	2.31	1.29	1.80	**1.95**	-0.16
A340-600	1.13	1.38	1.33	1.07	1.23	**1.46**	-0.23
A340-500	1.00	1.46	1.08	1.00	1.14	**1.38**	-0.25

The **numbers**

The following pages include key data for current-production commercial aircraft. Aircraft that have not yet entered service are not included, because the information available has not been confirmed by in-service experience.

Technical characteristics
The maximum take-off weight (MTOW) shows the minimum and maximum options available for the type in question. There may be intermediate weights available. The operating empty weight (OEW) is based on the manufacturers' figures. Airline weights are likely to be higher than those quoted.

Fuels and times
The figures shown for fuels and times are *Airfinance Journal*'s estimates based on a variety of sources. They are intended to reflect 60% passenger load factors, international standard atmosphere (ISA) conditions en-route, zero winds and optimum flight levels.

Indicative maintenance costs
The maintenance figures are intended as a guide to the order of magnitude of reserves associated with the various aircraft types. The figures are intended to reflect mature costs with no account taken of warranty effects and other reductions associated with new aircraft.

The C-check and heavy-check reserves are based on typical check costs and intervals. No allowance is made for cabin refurbishment. The cost quoted for component overhaul excludes inventory support.

Engine maintenance cost estimates are based on figures quoted in the *Airfinance Journal* guide to financing and investing in engines 2018, page 37. Unless stated, the engine costs refer to the most common engine type for the aircraft model in question.

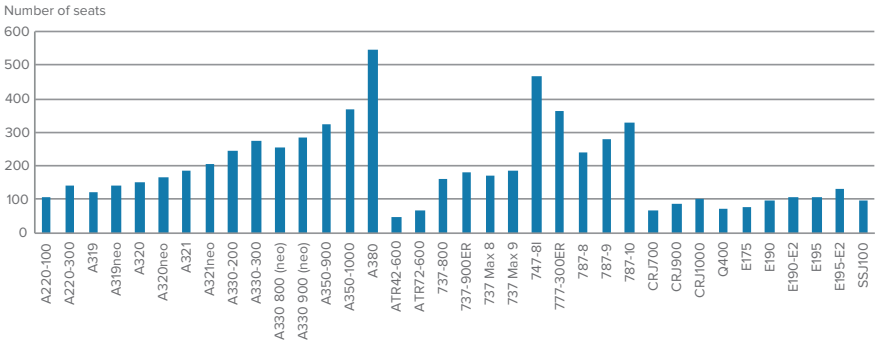
The information used to estimate the indicative maintenance reserves has been collected from a wide variety of sources. While *Airfinance Journal* has made every effort to normalise the data, direct comparisons between aircraft types may be misleading.

It should also be noted that maintenance costs of a particular type are highly dependent on the route structure, operating environment and maintenance philosophy of the airline with which the aircraft is in service. As such, our estimates are difficult to reconcile with the numbers provided by manufacturers.

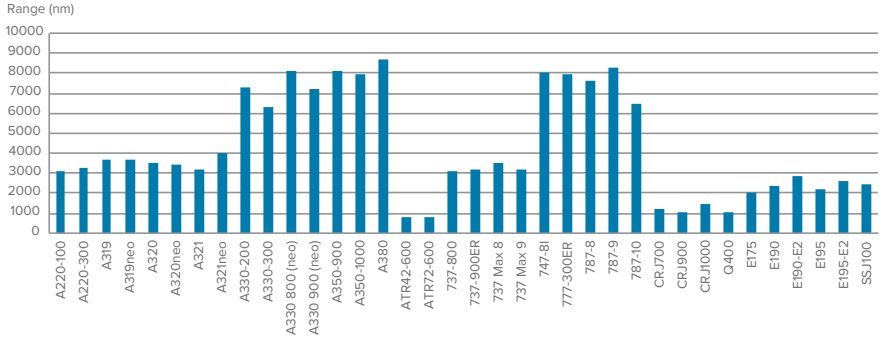
Seating/range
The numbers quoted for seating capacity are based on the manufacturers' selling standards. Large variations are possible, particularly for widebody aircraft. The ranges shown are for still-air conditions, optimum flight levels and are based on the typical seating figure and the operating empty weight quoted by the manufacturer. Ranges in airline operation are likely to be significantly less than the figures quoted.

Fleet information
Data is based on *Airfinance Journal*'s Fleet Tracker December 2018.

Current production aircraft seating



Current production aircraft range



Aircraft data index

Aircraft **data**

Airbus A220-100 (formerly CS100)

SEATING/RANGE	
Max seating	133
Typical seating	108
Maximum range	3,100nm (5,740km)
TECHNICAL CHARACTERISTICS	
MTOW	54.9 tonnes (option 60.8)
OEW	33.3 tonnes
MZFW	50.3 tonnes
Fuel capacity	22,040 litres
Engines	PW1521G/1524G/1525G
Thrust	21,000lbs to 23,3000lbs
FUELS AND TIMES	
Block fuel 200nm	1,340kg
Block fuel 500nm	2,510kg
Block fuel 1,000nm	4,500kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET	
Entry into service	2016
In service:	9
Operators (current and planned)	3
In storage	1
On order	69
Build peak year (2016)	5
Estimated production 2019	10
Average age (years)	1.5
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$55-60 per flight hour
Higher checks reserve	$50-55 per flight hour
Engine overhaul	$95-100 per engine flight hour
Engine LLP	$125-130 per engine cycle
Landing gear refurbishment	$35-40 per cycle
Wheels brakes and tyres	$120-130 per cycle
APU	$75-80 per propeller hour
Component overhaul	$210-220 per flight hour

Maintenance reserves are estimates based on similar aircraft types pending in-service confirmation of manufacturer claims.

Airbus A220-300 (formerly CS300)

SEATING/RANGE	
Max seating	160
Typical seating	140
Maximum range	3,300nm (6,110km)
TECHNICAL CHARACTERISTICS	
MTOW	59.9 tonnes (option 67.6)
OEW	34.3 tonnes
MZFW	50.3 tonnes
Fuel capacity	22,040 litres
Engines	PW1521G/1524G/1525G
Thrust	21,000lbs to 23,3000lbs
FUELS AND TIMES	
Block fuel 200nm	1,390kg
Block fuel 500nm	2,5610kg
Block fuel 1,000nm	4,700kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET	
Entry into service	2016
In service:	37
Operators (current)	4
In storage	0
On order	308
Build peak year (2018)	22
Estimated production 2019	35
Average age (years)	1.0
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$55-60 per flight hour
Higher checks reserve	$50-55 per flight hour
Engine overhaul	$105-110 per engine flight hour
Engine LLP	$125-130 per engine cycle
Landing gear refurbishment	$35-40 per cycle
Wheels brakes and tyres	$120-130 per cycle
APU	$75-80 per propeller hour
Component overhaul	$210-220 per flight hour

Maintenance reserves are estimates based on similar aircraft types pending in-service confirmation of manufacturer claims.

Airbus A319

SEATING/RANGE	
Max seating	145
Typical seating	124
Typical range	3,700nm (6,850km)
TECHNICAL CHARACTERISTICS	
MTOW	75.5 tonnes
OEW	40 tonnes
MZFW	58 tonnes
Fuel capacity	23,860 litres/29,840 litres
Engines	CFM56-5B
Thrust	22,000lbs (98kN)
FUELS AND TIMES	
Block fuel 200nm	1,710kg
Block fuel 500nm	3,140kg
Block fuel 1,000nm	5,620kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET (INCLUDING CORPORATE JET VERSIONS)	
Entry into service	1996
In service:	1,292
Operators (current)	164
In storage	42
On order	18
Built peak year (2005)	142
Estimated production 2019	5
Average age (years)	13
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$60-65 per flight hour
Higher checks reserve	$55-60 per flight hour
Engine overhaul	$100-105 per engine flight hour
Engine LLP	$125-130 per engine cycle
Landing gear refurbishment	$35-40 per cycle
Wheels brakes and tyres	$120-130 per cycle
APU	$75-80 per APU hour
Component overhaul	$210-220 per flight hour

Airbus A319neo

SEATING/RANGE	
Max seating	156
Typical seating	140
Typical range	3,700nm (6,850km)
TECHNICAL CHARACTERISTICS	
MTOW	75.5 tonnes
OEW	43 tonnes
MZFW	60.3 tonnes
Fuel capacity	23,760 litres/26,750 litres
Engines	Leap-1A/PW1100G
Thrust	24,100lbs (107kN)
FUELS AND TIMES	
Block fuel 200nm	1,450kg
Block fuel 500nm	2,670kg
Block fuel 1,000nm	4,780kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET (INCLUDING CORPORATE JET VERSIONS)	
Entry into service (planned)	2019
In service:	none
Operators (current)	none
In storage	none
On order	53
Built peak year	Not applicable
Estimated production 2019	10
Average age (years)	less than one
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$60-65 per flight hour
Higher checks reserve	$55-60 per flight hour
Engine overhaul	$100-105 per engine flight hour
Engine LLP	$125-130 per engine cycle
Landing gear refurbishment	$35-40 per cycle
Wheels brakes and tyres	$120-130 per cycle
APU	$75-80 per APU hour
Component overhaul	$210-220 per flight hour

Maintenance reserves are based on A319 current engine model pending confirmation of manufacturer's claimed reductions for new engine model.

Airbus A320

SEATING/RANGE	
Max seating	180
Typical seating	150
Typical range (with sharklets)	3,500nm (6,500km)
TECHNICAL CHARACTERISTICS	
MTOW	73.5 tonnes/78 tonnes
OEW	42 tonnes
MZFW	61 tonnes/62.5 tonnes
Fuel capacity	24,210 litres/27,200 litres
Engines	CFM56-5B/V2500
Thrust	25,000lbs (120kN)
FUELS AND TIMES	
Block fuel 200nm	1,850kg
Block fuel 500nm	3,390kg
Block fuel 1,000nm	6,080kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET (INCLUDING CORPORATE JET VERSIONS)	
Entry into service	1988
In service:	5,005
Operators (current and planned)	277
In storage	112
On order	134
Built peak year (2013)	352
Estimated production 2019	20
Average age (years)	9.5
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$60-65 per flight hour
Higher checks reserve	$55-60 per flight hour
Engine overhaul	$105-110 per engine flight hour
Engine LLP	$125-130 per engine cycle
Landing gear refurbishment	$35-40 per cycle
Wheels brakes and tyres	$120-130 per cycle
APU	$75-80 per APU hour
Component overhaul	$210-220 per flight hour

Airbus A320neo

SEATING/RANGE	
Max seating	194
Typical seating	150-165
Typical range	3,400nm (6,300km)
TECHNICAL CHARACTERISTICS	
MTOW	79 tonnes
OEW	44.5 tonnes
MZFW	62.8 tonnes/64.3 tonnes
Fuel capacity	23,760 litres/26,750 litres
Engines	Leap-1A/PW1100G
Thrust	27,000lbs (120kN)
FUELS AND TIMES	
Block fuel 200nm	1,570kg
Block fuel 500nm	2,880kg
Block fuel 1,000nm	5,170kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET	
Entry into service	2016
In service:	162
Operators (current and planned)	79
In storage	4
On order	3,855
Built peak year (2018)	203
Estimated production 2019	500
Average age (years)	0.7
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$60-65 per flight hour
Higher checks reserve	$55-60 per flight hour
Engine overhaul	$105-110 per engine flight hour
Engine LLP	$120-125 per engine cycle
Landing gear refurbishment	$35-40 per cycle
Wheels brakes and tyres	$120-130 per cycle
APU	$75-80 per APU hour
Component overhaul	$210-220 per flight hour

Maintenance reserves are based on A320 current engine model pending confirmation of manufacturer's claimed reductions for new engine model

Airbus A321-200

SEATING/RANGE	
Max seating	220
Typical seating	185
Maximum range	3,200nm (5,950km)
TECHNICAL CHARACTERISTICS	
MTOW	89 tonnes/93.5 tonnes
OEW	48 tonnes
MZFW	71.5 tonnes/73.8 tonnes
Fuel capacity	23,860 litres/29,840 litres
Engines	CFM56-5B/V2500
Thrust	27,000-33,000lbs (120-148kN)
FUELS AND TIMES	
Block fuel 200nm	2,310kg
Block fuel 500nm	4,230kg
Block fuel 1,000nm	7,590kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET (INCLUDING -100S)	
Entry into service	1996
In service:	1,640
Operators (current and planned)	110
In storage	30
On order	105
Built peak year (2013)	215
Estimated production 2019	10
Average age (years)	7.1
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$65-70 per flight hour
Higher checks reserve	$60-65 per flight hour
Engine overhaul	$120-125 per engine flight hour
Engine LLP	$125-130 per engine cycle
Landing gear refurbishment	$35-40 per cycle
Wheels brakes and tyres	$120-130 per cycle
APU	$75-80 per APU hour
Component overhaul	$210-220 per flight hour

Airbus A321neo

SEATING/RANGE	
Max seating	244
Typical seating	206
Maximum range	3,995nm (7,400km)
TECHNICAL CHARACTERISTICS	
MTOW	97 tonnes
OEW	50.1 tonnes
MZFW	73.3 tonnes/75.6 tonnes
Fuel capacity	23,600 litres/29,580 litres
Engines	Leap-1A/PW1100G
Thrust	32,000lbs (143kN)
FUELS AND TIMES	
Block fuel 200nm	1,960kg
Block fuel 500nm	3,600kg
Block fuel 1,000nm	6,450kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET	
Entry into service	2017
In service:	105
Operators (current and planned)	73
In storage	
On order	2,116
Build peak year (2018)	70
Estimated production 2019	200
Average age (years)	less than one
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$60-65 per flight hour
Higher checks reserve	$55-60 per flight hour
Engine overhaul	$120-125 per engine flight hour
Engine LLP	$125-130 per engine cycle
Landing gear refurbishment	$35-40 per cycle
Wheels brakes and tyres	$120-130 per cycle
APU	$75-80 per APU hour
Component overhaul	$210-220 per flight hour

Maintenance reserves are based on A321 current engine model pending confirmation of manufacturer's claimed reductions for new engine model.

Airbus A330-200

SEATING/RANGE	
Max seating	440
Typical seating	247
Maximum range	7,270nm (13,450km)
TECHNICAL CHARACTERISTICS	
MTOW	230 tonnes/242 tonnes
OEW	121 tonnes
MZFW	168 tonnes/170 tonnes
Fuel capacity	139,090 litres
Engines	PW4000/CF6-80E1/Trent 700
Thrust	68,000-72,000lbs (303-316kN)
FUELS AND TIMES	
Block fuel 1,000nm	12,720kg
Block fuel 2,000nm	23,710kg
Block fuel 4,000nm	45,680kg
Bock time 1,000nm	184 minutes
Block time 2,000nm	299 minutes
Block time 4,000nm	529 minutes
FLEET	
Entry into service	1998
In service:	547
Operators (current and planned)	104
In storage	21
On order	17
Build peak year (2013)	51
Estimated production 2019	10
Average age (years)	9.5
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$105-110 per flight hour
Higher checks reserve	$95-100 per flight hour
Engine overhaul	$265-270 per engine flight hour
Engine LLP	$245-250 per engine cycle
Landing gear refurbishment	$150-155 per cycle
Wheels brakes and tyres	$375-380 per cycle
APU	$105-110 per APU hour
Component overhaul	$420-425 per flight hour

Airbus A330-200 Freighter

SEATING/RANGE	
Max Payload	65 tonnes
Maximum range	4,000nm (7,400km)
TECHNICAL CHARACTERISTICS	
MTOW	233 tonnes
OEW	115 tonnes
MZFW	178 tonnes
Fuel capacity	97,530 litres
Engines	RR Trent700/PW4000
Thrust	68,000-72,000lbs (302-320kN)
FUELS AND TIMES	
Block fuel 1,000nm	12,720kg
Block fuel 2,000nm	23,710kg
Block fuel 4,000nm	45,680kg
Bock time 1,000nm	184 minutes
Block time 2,000nm	299 minutes
Block time 4,000nm	529 minutes
FLEET	
Entry into service	2010
In service:	37
Operators (current and planned)	10
In storage	1
On order	4
Build peak year (2012)	8
Estimated production 2019	4
Average age (years)	5.4
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$105-110 per flight hour
Higher checks reserve	$95-100 per flight hour
Engine overhaul	$265-270 per engine flight hour
Engine LLP	$245-250 per engine cycle
Landing gear refurbishment	$150-155 per cycle
Wheels brakes and tyres	$375-380 per cycle
APU	$105-110 per APU hour
Component overhaul	$420-425 per flight hour

Airbus A330-300

SEATING/RANGE	
Max seating	440
Typical seating	277
Maximum range	6,340nm (11,750km)
TECHNICAL CHARACTERISTICS	
MTOW	230 tonnes/242 tonnes
OEW	121 tonnes
MZFW	173 tonnes/175 tonnes
Fuel capacity	97,530 litres
Engines	PW4000/CF6-80E1/Trent 700
Thrust	68,000-72,000lbs (303-316kN)
FUELS AND TIMES	
Block fuel 1,000nm	13,120kg
Block fuel 2,000nm	24,460kg
Block fuel 4,000nm	47,120kg
Bock time 1,000nm	184 minutes
Block time 2,000nm	299 minutes
Block time 4,000nm	529 minutes
FLEET	
Entry into service	1993
In service:	699
Operators (current and planned)	77
In storage	22
On order	31
Build peak year (2014)	74
Estimated production 2019	10
Average age (years)	8.6
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$105-110 per flight hour
Higher checks reserve	$95-100 per flight hour
Engine overhaul	$265-270 per engine flight hour
Engine LLP	$245-250 per engine cycle
Landing gear refurbishment	$150-155 per cycle
Wheels brakes and tyres	$375-380 per cycle
APU	$105-110 per APU hour
Component overhaul	$420-425 per flight hour

Airbus A330-800

SEATING/RANGE	
Max seating	406
Typical seating	257
Typical range	8,150nm (15,090km)
TECHNICAL CHARACTERISTICS	
MTOW	251 tonnes
OEW	110 tonnes
MZFW	176 tonnes
Fuel capacity	139,090 litres
Engines	Trent 7000
Thrust	68,000lbs (303kN)
FUELS AND TIMES	
Block fuel 1,000nm	10,950kg
Block fuel 2,000nm	21,040kg
Block fuel 4,000nm	40,520kg
Bock time 1,000nm	184 minutes
Block time 2,000nm	299 minutes
Block time 4,000nm	529 minutes
FLEET	
Entry into service (planned)	2019
In service	none
Operators (current and planned)	1
In storage	none
On order	8
Built peak year	Not applicable
Estimated production 2019	8
Average age	Not applicable
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$105-110 per flight hour
Higher checks reserve	$95-100/flight hour
Engine overhaul	$265-270/engine flight hour
Engine LLP	$245-250/engine cycle
Landing gear refurbishment	$150-155/cycle
Wheels, brakes and tyres	$375-380/cycle
APU	$105-110/APU hour
Component overhaul	$420-425/flight hour

Maintenance reserves are based on A330-300 model pending confirmation of manufacturer's claimed reductions for new engine model.

Airbus A330-900neo

SEATING/RANGE	
Max seating	440
Typical seating	287
Maximum range	7,200nm (13,330km)
TECHNICAL CHARACTERISTICS	
MTOW	242 tonnes
OEW	115 tonnes
MZFW	181 tonnes
Fuel capacity	139,090 litres
Engines	Trent 7000
Thrust	68,000lbs (303kN)
FUELS AND TIMES	
Block fuel 1,000nm	11,280 kg
Block fuel 2,000nm	21,040 kg
Block fuel 4,000nm	40,520 kg
Bock time 1,000nm	184 minutes
Block time 2,000nm	299 minutes
Block time 4,000nm	529 minutes
FLEET	
Entry into service	2018
In service:	none
Operators (current and planned)	17
In storage	none
On order	242
Build peak year	Not applicable
Estimated production 2019	50
Average age (years)	Not applicable
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$105-110 per flight hour
Higher checks reserve	$95-100 per flight hour
Engine overhaul	$265-270 per engine flight hour
Engine LLP	$245-250 per engine cycle
Landing gear refurbishment	$150-155 per cycle
Wheels brakes and tyres	$375-380 per cycle
APU	$105-110 per APU hour
Component overhaul	$420-425 per flight hour

Maintenance reserves are based on A330-300 model pending confirmation of manufacturer's claimed reductions for new engine model.

Airbus A350-900

SEATING/RANGE	
Max seating	440
Typical seating	325
Maximum range	8,100nm (15,000km)
TECHNICAL CHARACTERISTICS	
MTOW	268 tonnes
OEW	161 tonnes
MZFW	192 tonnes
Fuel capacity	138,000 litres
Engines	Trent XWB
Thrust	84,000lbs (374kN)
FUELS AND TIMES	
Block fuel 1,000nm	11,810kg
Block fuel 2,000nm	22,010kg
Block fuel 4,000nm	42,410kg
Bock time 1,000nm	179 minutes
Block time 2,000nm	291 minutes
Block time 4,000nm	512 minutes
FLEET	
Entry into service	2014
In service:	207
Operators (current and planned)	51
In storage	none
On order	543
Build peak year (2018 estimated)	65
Estimated production 2019	175
Average age (years)	1.5
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$105-110 per flight hour
Higher checks reserve	$95-100 per flight hour
Engine overhaul	$295-300 per engine flight hour
Engine LLP	$270-275 per engine cycle
Landing gear refurbishment	$150-155 per cycle
Wheels brakes and tyres	$375-380 per cycle
APU	$105-110 per APU hour
Component overhaul	$420-425 per flight hour

Airbus A350-1000

SEATING/RANGE	
Max seating	440
Typical seating	366
Maximum range	7,950nm (14,800km)
TECHNICAL CHARACTERISTICS	
MTOW	308 tonnes
OEW	116 tonnes
MZFW	220 tonnes
Fuel capacity	156,000 litres
Engines	Trent XWB
Thrust	97,000lbs (432kN)
FUELS AND TIMES	
Block fuel 1,000nm	13,860kg
Block fuel 2,000nm	25,840kg
Block fuel 4,000nm	49,770kg
Bock time 1,000nm	179 minutes
Block time 2,000nm	291 minutes
Block time 4,000nm	512 minutes
FLEET	
Entry into service	2018
In service:	10
Operators (current and planned)	13
In storage	none
On order	165
Build peak year (2018 estimated)	Not applicable
Estimated production 2019	45
Average age (years)	Less than one
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$105-110 per flight hour
Higher checks reserve	$95-100 per flight hour
Engine overhaul	$315-320 per engine flight hour
Engine LLP	$290-295 per engine cycle
Landing gear refurbishment	$150-155 per cycle
Wheels brakes and tyres	$375-380 per cycle
APU	$105-110 per APU hour
Component overhaul	$420-425 per flight hour

Maintenance reserves are based on A350-900 model pending confirmation of manufacturer's claimed reductions for new engine model.

Airbus A380

SEATING/RANGE	
Max seating	853
Typical seating	544 (four class)
Maximum range	8,700nm (15,200km)
TECHNICAL CHARACTERISTICS	
MTOW	575 tonnes
OEW	277 tonnes
MZFW	369 tonnes
Fuel capacity	320,000 litres
Engines	GP7200/Trent 900
Thrust	70,000lbs (311kN)
FUELS AND TIMES	
Block fuel 1,000nm	26,590kg
Block fuel 2,000nm	50,580kg
Block fuel 4,000nm	104,290kg
Bock time 1,000nm	146 minutes
Block time 2,000nm	265 minutes
Block time 4,000nm	501 minutes
FLEET	
Entry into service	2007
In service:	228
Operators (current and planned)	19
In storage	4
On order	98
Build peak year (2012)	30
Estimated production 2019	4
Average age (years)	5.4
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$160-165 per flight hour
Higher checks reserve	$145-150 per flight hour
Engine overhaul	$195-200 per engine flight hour
Engine LLP	$200-205 per engine cycle
Landing gear refurbishment	$200-205 per cycle
Wheels brakes and tyres	$565-570 per cycle
APU	$155-160 per APU hour
Component overhaul	$575-580 per flight hour

ATR42-600

SEATING/RANGE	
Max seating	50
Typical seating	48
Maximum range	800nm (1,480km)
TECHNICAL CHARACTERISTICS	
MTOW	18.6 tonnes
OEW	11.5 tonnes
MZFW	16.7 tonnes
Fuel capacity	5,700 litres
Engines	PW127M
Thrust	2,160 shp
FUELS AND TIMES	
Block fuel 100nm	340kg
Block fuel 200nm	560kg
Block fuel 500nm	1,210kg
Bock time 100nm	33 minutes
Block time 200nm	55 minutes
Block time 500nm	122 minutes
FLEET	
Entry into service	2012 (1996 for -500)
In service:	38 (274 all versions)
Operators (current and planned)	18
In storage	none
On order	21
Build peak year (2014)	7
Estimated production 2019	5
Average age (years)	3.7
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$35-40 per flight hour
Higher checks reserve	$25-30 per flight hour
Engine overhaul	$100-105 per engine flight hour
Engine LLP	$30-35 per engine cycle
Landing gear refurbishment	$20-25 per cycle
Wheels brakes and tyres	$35-40 per cycle
APU	$15-20 per propeller hour
Component overhaul	$115-120 per flight hour

ATR72-600

SEATING/RANGE	
Max seating	78
Typical seating	70
Maximum range	825nm (1,526km)
TECHNICAL CHARACTERISTICS	
MTOW	22.8 tonnes
OEW	14 tonnes
MZFW	20.8 tonnes
Fuel capacity	6,370 litres
Engines	PW127M
Thrust	2,475 shp
FUELS AND TIMES	
Block fuel 100nm	370kg
Block fuel 200nm	610kg
Block fuel 500nm	1,310kg
Bock time 100nm	36 minutes
Block time 200nm	58 minutes
Block time 500nm	125 minutes
FLEET	
Entry into service	2011 (1998 for -500)
In service:	348 (815 all versions)
Operators (current and planned)	88
In storage	4
On order	224
Build peak year (2015)	79
Estimated production 2019	95
Average age (years)	2.4
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$35-40 per flight hour
Higher checks reserve	$25-30 per flight hour
Engine overhaul	$100-105 per engine flight hour
Engine LLP	$30-35 per engine cycle
Landing gear refurbishment	$20-25 per cycle
Wheels brakes and tyres	$35-40 per cycle
APU	$15-20 per propeller hour
Component overhaul	$125-130 per flight hour

Boeing 737-800

SEATING/RANGE	
Max seating	189
Typical seating	162
Maximum range (with winglets)	3,115nm (5,767km)
TECHNICAL CHARACTERISTICS	
MTOW	79 tonnes
OEW	41.1 tonnes
MZFW	61.7 tonnes
Fuel capacity	26,020 litres/40,580 litres
Engines	CFM56-7B
Thrust	27,300lbs (121kN)
FUELS AND TIMES	
Block fuel 200nm	2,000kg
Block fuel 500nm	3,530kg
Block fuel 1,000nm	6,190kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET	
Entry into service	1998
In service:	4,839
Operators (current and planned)	207
In storage	27
On order	85
Build peak year (2016)	408
Estimated production 2019	40
Average age (years)	7.9
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$65-70 per flight hour
Higher checks reserve	$50-55 per flight hour
Engine overhaul	$120-125 per engine flight hour
Engine LLP	$125-130 per engine cycle
Landing gear refurbishment	$45-50 per cycle
Wheels brakes and tyres	$70-75 per cycle
APU	$80-85 per propeller hour
Component overhaul	$210-220 per flight hour

Boeing 737-900ER

SEATING/RANGE	
Max seating	215
Typical seating	180
Maximum range	3,200nm (5,924km)
TECHNICAL CHARACTERISTICS	
MTOW	85.1 tonnes
OEW	42.5 tonnes
MZFW	67.8 tonnes
Fuel capacity	29,660 litres
Engines	CFM56-7B
Thrust	27,300lbs (121kN)
FUELS AND TIMES	
Block fuel 200nm	2,080kg
Block fuel 500nm	3,660kg
Block fuel 1,000nm	6,420kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET	
Entry into service	2001
In service:	470
Operators (current and planned)	25
In storage	4
On order	37
Build peak year (2015)	73
Estimated production 2019	21
Average age (years)	5.1
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$70-75 per flight hour
Higher checks reserve	$50-55 per flight hour
Engine overhaul	$120-125 per engine flight hour
Engine LLP	$125-130 per engine cycle
Landing gear refurbishment	$45-50 per cycle
Wheels brakes and tyres	$70-75 per cycle
APU	$80-85 per propeller hour
Component overhaul	$210-220 per flight hour

Boeing 737 Max 8

SEATING/RANGE	
Max seating	200
Typical seating	162-172
Maximum range	3,515nm (6,510km)
TECHNICAL CHARACTERISTICS	
MTOW	82.2 tonnes
OEW	45.1 tonnes
MZFW	65.9 tonnes
Fuel capacity	25,810 litres
Engines	Leap-1B
Thrust	26,780lbs (119kN)
FUELS AND TIMES	
Block fuel 200nm	1,720kg
Block fuel 500nm	3,040kg
Block fuel 1,000nm	5,320kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET	
Entry into service (planned)	2017
In service:	230
Operators (current and planned)	93
In storage	none
On order	3,686 including Max 200
Build peak year (2018)	194
Estimated production 2019	200
Average age (years)	less than one
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$65-70 per flight hour
Higher checks reserve	$50-55 per flight hour
Engine overhaul	$120-125 per engine flight hour
Engine LLP	$125-130 per engine cycle
Landing gear refurbishment	$45-50 per cycle
Wheels brakes and tyres	$70-75 per cycle
APU	$80-85 per propeller hour
Component overhaul	$210-220 per flight hour

Maintenance reserves are estimates based on 737-800 model pending in-service feedback and confirmation of claimed savings.

Boeing 737 Max 9

SEATING/RANGE	
Max seating	220
Typical seating	178-193
Maximum range	3,215nm (5,960km)
TECHNICAL CHARACTERISTICS	
MTOW	88.3 tonnes
OEW	45.1 tonnes
MZFW	71.0 tonnes
Fuel capacity	25,810 litres
Engines	Leap-1B
Thrust	27,300 (121kN)
FUELS AND TIMES	
Block fuel 200nm	1,790kg
Block fuel 500nm	3,150kg
Block fuel 1,000nm	5,520kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET	
Entry into service (planned)	2018
In service:	11
Operators (current and planned)	15
In storage	none
On order	299
Build peak year	Not applicable
Estimated production 2019	45
Average age (years)	Less than one
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$70-75 per flight hour
Higher checks reserve	$50-55 per flight hour
Engine overhaul	$20-125 per engine flight hour
Engine LLP	$125-130 per engine cycle
Landing gear refurbishment	$45-50 per cycle
Wheels brakes and tyres	$70-75 per cycle
APU	$80-85 per propeller hour
Component overhaul	$210-220 per flight hour

Maintenance reserves are estimates based on 737-900 model pending in-service feedback and confirmation of claimed savings.

Boeing 747-8I

SEATING/RANGE	
Max seating	605
Typical seating	467
Maximum range	8,000nm (14,815km)
TECHNICAL CHARACTERISTICS	
MTOW	447.7 tonnes
OEW	218 tonnes
MZFW	295 tonnes
Fuel capacity	238,610 litres
Engines	GEnx-2B67
Thrust	66,500lbs (374kN)
FUELS AND TIMES	
Block fuel 1,000nm	20,370kg
Block fuel 2,000nm	38,760kg
Block fuel 4,000nm	79,910kg
Bock time 1,000nm	146 minutes
Block time 2,000nm	265 minutes
Block time 4,000nm	501 minutes
FLEET	
Entry into service	2011
In service:	41 (plus 5 BBJs)
Operators (current and planned)	5
In storage	2
On order	1
Build peak year (2015)	11
Estimated production 2019	none
Average age (years)	4.1
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$155-160 per flight hour
Higher checks reserve	$115-120 per flight hour
Engine overhaul	$170-175 per engine flight hour
Engine LLP	$260-265 per engine cycle
Landing gear refurbishment	$160-165 per cycle
Wheels brakes and tyres	$750-755 per cycle
APU	$105-110 per APU hour
Component overhaul	$505-510 per flight hour

Boeing 747-8F

SEATING/RANGE	
Max Payload	137.7 tonnes
Maximum range	4,120nm (7,630km)
TECHNICAL CHARACTERISTICS	
MTOW	447.7 tonnes
OEW	197 tonnes
MZFW	329.8 tonnes
Fuel capacity	226,180 litres
Engines	GEnx-2B
Thrust	66,500 (296kN)
FUELS AND TIMES	
Block fuel 1,000nm	20,730kg
Block fuel 2,000nm	38,760kg
Block fuel 4,000nm	79,910kg
Bock time 1,000nm	146 minutes
Block time 2,000nm	265 minutes
Block time 4,000nm	501 minutes
FLEET	
Entry into service	2010
In service:	82
Operators (current and planned)	14
In storage	0
On order	21
Build peak year (2013)	20
Estimated production 2019	1
Average age (years)	4.7
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$155-160 per flight hour
Higher checks reserve	$115-120 per flight hour
Engine overhaul	$170-175 per engine flight hour
Engine LLP	$260-265 per engine cycle
Landing gear refurbishment	$160-165 per cycle
Wheels brakes and tyres	$750-755 per cycle
APU	$105-110 per APU hour
Component overhaul	$505-510 per flight hour

Boeing 777-300ER

SEATING/RANGE	
Max seating	550
Typical seating	365 (three class)
Maximum range	7,930nm (14,685km)
TECHNICAL CHARACTERISTICS	
MTOW	351.5 tonnes
OEW	168 tonnes
MZFW	238 tonnes
Fuel capacity	181,280 litres
Engines	GE90-115BL
Thrust	115,300lbs (504kN)
FUELS AND TIMES	
Block fuel 1,000nm	15,610kg
Block fuel 2,000nm	29,840kg
Block fuel 4,000nm	60,900kg
Bock time 1,000nm	152 minutes
Block time 2,000nm	277 minutes
Block time 4,000nm	525 minutes
FLEET	
Entry into service	2003
In service:	794
Operators (current and planned)	48
In storage	3
On order	37
Build peak year (2016)	89
Estimated production 2019	20
Average age (years)	6.5
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$125-130 per flight hour
Higher checks reserve	$90-95 per flight hour
Engine overhaul	$295-300 per engine flight hour
Engine LLP	$450-455 per engine cycle
Landing gear refurbishment	$160-165 per cycle
Wheels brakes and tyres	$480-485 per cycle
APU	$105-110 per APU hour
Component overhaul	$410-415 per flight hour

Boeing 787-8

SEATING/RANGE	
Max seating	350
Typical seating	242
Maximum range	7,650nm to 8,200nm (14,200km to 15,200km)
TECHNICAL CHARACTERISTICS	
MTOW	227.9 tonnes
OEW	110 tonnes
MZFW	172 tonnes
Fuel capacity	126,920 litres
Engines	GEnx/Trent 1000
Thrust	64,000lbs (280kN)
FUELS AND TIMES	
Block fuel 1,000nm	10,170kg
Block fuel 2,000nm	18,970kg
Block fuel 4,000nm	36,540kg
Bock time 1,000nm	178 minutes
Block time 2,000nm	265 minutes
Block time 4,000nm	510 minutes
FLEET	
Entry into service	2011
In service:	355
Operators (current and planned)	54
In storage	3
On order	87
Build peak year (2014)	104
Estimated production 2019	20
Average age (years)	3.3
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$110-115 per flight hour
Higher checks reserve	$80-85 per flight hour
Engine overhaul	$300-310 per engine flight hour
Engine LLP	$305-310 per engine cycle
Landing gear refurbishment	$75-80 per cycle
Wheels brakes and tyres	$100-105 per cycle
APU	$105-110 per APU hour
Component overhaul	$315-320 per flight hour

Boeing 787-9

SEATING/RANGE	
Max seating	408
Typical seating	280 (two class)
Maximum range	8,300nm (14,370km)
TECHNICAL CHARACTERISTICS	
MTOW	252.7 tonnes
OEW	120 tonnes
MZFW	181 tonnes
Fuel capacity	138,700 litres
Engines	GEnx1B/Trent 1000
Thrust	71,000lbs (320kN)
FUELS AND TIMES	
Block fuel 1,000nm	10,480kg
Block fuel 2,000nm	19,500kg
Block fuel 4,000nm	37,630kg
Bock time 1,000nm	178 minutes
Block time 2,000nm	265 minutes
Block time 4,000nm	510 minutes
FLEET	
Entry into service	2014
In service:	387
Operators (current and planned)	63
In storage	4
On order	401
Build peak year (2017)	110
Estimated production 2019	125
Average age (years)	1.8
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$110-115 per flight hour
Higher checks reserve	$85-90 per flight hour
Engine overhaul	$310-315 per engine flight hour
Engine LLP	$320-325 per engine cycle
Landing gear refurbishment	$75-80 per cycle
Wheels brakes and tyres	$100-105 per cycle
APU	$125-130 per APU hour
Component overhaul	$320-325 per flight hour

Boeing 787-10

SEATING/RANGE	
Max seating	440
Typical seating	330
Maximum range	6,430nm (11,9100km)
TECHNICAL CHARACTERISTICS	
MTOW	254.0 tonnes
OEW	130.0 tonnes
MZFW	192.7 tonnes
Fuel capacity	126,370 litres
Engines	GEnx-1B/Trent 1000
Thrust	76,000 (340kN)
FUELS AND TIMES	
Block fuel 1,000nm	11,310kg
Block fuel 2,000nm	21,080kg
Block fuel 4,000nm	40,620kg
Bock time 1,000nm	146 minutes
Block time 2,000nm	265 minutes
Block time 4,000nm	501 minutes
FLEET	
Entry into service (planned)	2018
In service:	8
Operators (current and planned)	10
In storage	2
On order	152
Build peak year	Not applicable
Estimated production 2019	50
Average age (years)	Less than one
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$120-125 per flight hour
Higher checks reserve	$90-95per flight hour
Engine overhaul	$315-320 per engine flight hour
Engine LLP	$320-325 per engine cycle
Landing gear refurbishment	$75-80 per cycle
Wheels brakes and tyres	$105-110 per cycle
APU	$125-130 per APU hour
Component overhaul	$330-335 per flight hour

Bombardier CRJ700

SEATING/RANGE	
Max seating	78
Typical seating	70
Maximum range	1,220nm (2,260km)
TECHNICAL CHARACTERISTICS	
MTOW	33 tonnes
OEW	20.1 tonnes
MZFW	28.3 tonnes
Fuel capacity	10,990 litres
Engines	CF34-8C5B1
Thrust	12,670lbs (56kN)
FUELS AND TIMES	
Block fuel 200nm	1,150kg
Block fuel 500nm	1,950kg
Block time 200nm	45 minutes
Bock time 500nm	88 minutes
FLEET	
Entry into service	2001
In service:	315
Operators (current and planned)	3
In storage	16
On order	8
Build peak year (2005)	68
Estimated production 2019	5
Average age (years)	13.0
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$45-50 per flight hour
Higher checks reserve	$35-40 per flight hour
Engine overhaul	$75-80 per engine flight hour
Engine LLP	$105-110 per engine cycle
Landing gear refurbishment	$30-35 per cycle
Wheels brakes and tyres	$45-50 per cycle
APU	$55-60 per APU hour
Component overhaul	$150-160 per flight hour

Bombardier CRJ900

SEATING/RANGE	
Max seating	90
Typical seating	88
Maximum range	1,040nm (1,940km)
TECHNICAL CHARACTERISTICS	
MTOW	36.5 tonnes
OEW	21.8 tonnes
MZFW	31.8 tonnes
Fuel capacity	10,990 litres
Engines	CF34-8C5
Thrust	13,360lbs (59kN)
FUELS AND TIMES	
Block fuel 200nm	1,240kg
Block fuel 500nm	2,100kg
Block time 200nm	45 minutes
Bock time 500nm	88 minutes
FLEET	
Entry into service	2003
In service:	438
Operators (current and planned)	27
In storage	9
On order	69
Build peak year (2008)	59
Estimated production 2019	30
Average age (years)	7.9
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$50-55 per flight hour
Higher checks reserve	$35-40 per flight hour
Engine overhaul	$75-80 per engine flight hour
Engine LLP	$105-110 per engine cycle
Landing gear refurbishment	$30-35 per cycle
Wheels brakes and tyres	$50-55 per cycle
APU	$60-65 per APU hour
Component overhaul	$160-165 per flight hour

Bombardier CRJ1000

SEATING/RANGE	
Max seating	104
Typical seating	100
Maximum range	1,425nm (2,640km)
TECHNICAL CHARACTERISTICS	
MTOW	40.8 tonnes
OEW	23.2 tonnes
MZFW	35.2 tonnes
Fuel capacity	10,990 litres
Engines	CF34-8C5A1
Thrust	13,3600lbs (59kN)
FUELS AND TIMES	
Block fuel 200nm	1,320kg
Block fuel 500nm	2,200kg
Block time 200nm	45 minutes
Bock time 500nm	88 minutes
FLEET	
Entry into service	2011
In service:	62
Operators (current and planned)	8
In storage	2
On order	5
Build peak year (2011)	17
Estimated production 2019	5
Average age (years)	5.1
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$50-55 per flight hour
Higher checks reserve	$35-40 per flight hour
Engine overhaul	$75-80 per engine flight hour
Engine LLP	$105-110 per engine cycle
Landing gear refurbishment	$30-35 per cycle
Wheels brakes and tyres	$50-55 per cycle
APU	$60-65 per APU hour
Component overhaul	$160-165 per flight hour

Bombardier Q400

SEATING/RANGE	
Max seating	90
Typical seating	74
Maximum range	1,010nm (1,870km)
TECHNICAL CHARACTERISTICS	
MTOW	29.5 tonnes
OEW	17.8 tonnes
MZFW	26.3 tonnes
Fuel capacity	6,700 litres
Engines	PW150A
Thrust	5,070shp
FUELS AND TIMES	
Block fuel 100nm	525kg
Block fuel 200nm	855kg
Block fuel 500nm	1,860kg
Bock time 100nm	35 minutes
Block time 200nm	55 minutes
Block time 500nm	108 minutes
FLEET	
Entry into service	1999
In service:	519
Operators (current and planned)	64
In storage	34
On order	68
Build peak year (2007)	42
Estimated production 2019	24
Average age (years)	8.4
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$45-50 per flight hour
Higher checks reserve	$34-35 per flight hour
Engine overhaul	$150-155 per engine flight hour
Engine LLP	$45-50 per engine cycle
Landing gear refurbishment	$35-40 per cycle
Wheels brakes and tyres	$45-50 per cycle
APU	$55-60 per propeller hour
Propeller	$15-20 per flight hour
Component overhaul	$145-150 per propeller hour

Embraer E175

SEATING/RANGE	
Max seating	88
Typical seating	78
Maximum range	2,000nm (3,706km)
TECHNICAL CHARACTERISTICS	
MTOW	37.5 tonnes
OEW	21.62 tonnes
MZFW	31.7 tonnes
Fuel capacity	11,670 litres
Engines	CF34-8E
Thrust	13,800lbs
FUELS AND TIMES	
Block fuel 200nm	1,180kg
Block fuel 500nm	2,390kg
Block time 200nm	45 minutes
Bock time 500nm	81 minutes
FLEET	
Entry into service	2005
In service:	554
Operators (current and planned)	24
In storage	2
On order	103
Build peak year (2016)	84
Estimated production 2019	40
Average age (years)	5.1
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$45-50 per flight hour
Higher checks reserve	$35-40 per flight hour
Engine overhaul	$75-80 per engine flight hour
Engine LLP	$105-110 per engine cycle
Landing gear refurbishment	$30-35 per cycle
Wheels brakes and tyres	$50-55 per cycle
APU	$55-60 per APU hour
Component overhaul	$150-160 per flight hour

Embraer E190

SEATING/RANGE	
Max seating	114
Typical seating	98
Maximum range	2,400nm (4,448km)
TECHNICAL CHARACTERISTICS	
MTOW	47.8 tonnes
OEW	27.72 tonnes
MZFW	40.8 tonnes
Fuel capacity	16,210 litres
Engines	CF34-10E
Thrust	18,500lbs
FUELS AND TIMES	
Block fuel 200nm	1,340kg
Block fuel 500nm	2,710kg
Block time 200nm	46 minutes
Bock time 500nm	83 minutes
FLEET	
Entry into service	2005
In service:	533
Operators (current and planned)	66
In storage	31
On order	10
Build peak year (2011)	71
Estimated production 2019	10
Average age (years)	8.1
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$45-50 per flight hour
Higher checks reserve	$35-40 per flight hour
Engine overhaul	$75-80 per engine flight hour
Engine LLP	$95-100 per engine cycle
Landing gear refurbishment	$35-40 per cycle
Wheels brakes and tyres	$55-60 per cycle
APU	$70-75 per APU hour
Component overhaul	$180-185 per flight hour

Embraer E190-E2

SEATING/RANGE	
Max seating	114
Typical seating	106
Maximum range	2,850nm (5,280km)
TECHNICAL CHARACTERISTICS	
MTOW	61.5 tonnes
OEW	Data not available
MZFW	Data not available
Fuel capacity	16,500 litres
Engines	Pratt & Whitney PW1919
Thrust	19,000lbs (85kN)
FUELS AND TIMES	
Block fuel 200nm	1,140kg
Block fuel 500nm	2,300kg
Block time 200nm	46 minutes
Bock time 500nm	83 minutes
FLEET	
Entry into service	2018
In service:	3
Operators (current and planned)	7
In storage	none
On order	59
Build peak year (2019)	Not applicable
Estimated production 2018	17
Average age (years)	Not applicable
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$45-50 per flight hour
Higher checks reserve	$35-40 per flight hour
Engine overhaul	No data
Engine LLP	No data
Landing gear refurbishment	$35-40 per cycle
Wheels brakes and tyres	$55-60 per cycle
APU	$70-75 per APU hour
Component overhaul	$18-185 per flight hour

Maintenance reserves are estimates based on E190 model pending in-service feedback and confirmation of claimed savings.

Embraer E195

SEATING/RANGE	
Max seating	122
Typical seating	108
Maximum range	2,200nm (4,077km)
TECHNICAL CHARACTERISTICS	
MTOW	48.79 tonnes
OEW	28.85 tonnes
MZFW	42.5 tonnes
Fuel capacity	16,210 litres
Engines	CF34-10E
Thrust	18,500lbs
FUELS AND TIMES	
Block fuel 200nm	1,420kg
Block fuel 500nm	2,870kg
Block time 200nm	47 minutes
Bock time 500nm	85 minutes
FLEET	
Entry into service	2006
In service:	154
Operators (current and planned)	24
In storage	5
On order	5
Build peak year (2011)	
Estimated production 2019	5
Average age (years)	6.9
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$45-50 per flight hour
Higher checks reserve	$35-40 per flight hour
Engine overhaul	$75-80 per engine flight hour
Engine LLP	$95-100 per engine cycle
Landing gear refurbishment	$35-40 per cycle
Wheels brakes and tyres	$55-60 per cycle
APU	$70-75 per APU hour
Component overhaul	$180-185 per flight hour

Embraer E195-E2

SEATING/RANGE	
Max seating	146
Typical seating	132
Typical range	2,600nm (4,800km)
TECHNICAL CHARACTERISTICS	
MTOW	61.5 tonnes
OEW	Data not available
MZFW	Data not available
Estimated fuel capacity	16,5000 litres
Engines	Pratt & Whitney PW1919
Thrust	19,000lbs (85kN)
FUELS AND TIMES	
Block fuel 200nm	1,140kg
Block fuel 500nm	2,300kg
Bock time 200nm	46 minutes
Block time 500nm	83 minutes
FLEET	
Entry into service (planned)	2019
In service	0
Operators (current and planned)	5
In storage	none
On order	73
Built peak year	Not applicable
Estimated production 2019	20
Average age	Not applicable
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$45-50 per flight hour
Higher checks reserve	$35-40/flight hour
Engine overhaul	No data
Engine LLP	No data
Landing gear refurbishment	$35-40/cycle
Wheels, brakes and tyres	$55-60/cycle
APU	$70-75/APU hour
Component overhaul	$18-185/flight hour

Maintenance reserves are estimates based on E195 model pending in-service feedback and confirmation of claimed savings.

Sukhoi SSJ100

SEATING/RANGE	
Max seating	108
Typical seating	98
Maximum range (basic version)	1,645nm (3,048km)
Maximum range (LR version)	2,470nm (4,578km)
TECHNICAL CHARACTERISTICS	
MTOW (basic version)	45.8 tonnes
MTOW (LR version)	48.5 tonnes
OEW (basic version)	24.3 tonnes
OEW (LR version)	25.1 tonnes
MZFW (basic version)	36.6 tonnes
MZFW (LR version)	37.4 tonnes
Fuel capacity	13,135 litres
Engines	PowerJet SaM146-1S17/8
Thrust	17,800lbs with automatic power reserve
FUELS AND TIMES	
Block fuel 200nm	1,150kg
Block fuel 500nm	2,340kg
Block time 200nm	46 minutes
Bock time 500nm	83 minutes
FLEET	
Entry into service	2011
In service:	129
Operators (current and planned)	32
In storage	25
On order	140
Build peak year (2017)	26
Estimated production 2019	30
Average age (years)	3.7
INDICATIVE MAINTENANCE RESERVES	
Insufficient data available	

New aircraft market values ($ million)

Model	Avitas view	CV view	IBA view	ICF view	MBA view	Oriel view	Average
Airbus							
A220-100	31.5	29.3	35.3	31.9	34.0	36.9	**33.2**
A220-300	36.6	35.2	39.3	34.6	38.3	43.0	**37.8**
A319	36.5	36.1	35.2	33.6	36.0	28.4	**34.3**
A319neo	-	-	-	-	37.2	-	**37.2**
A320	44.1	42.6	44.2	40.8	45.2	45.0	**43.7**
A320neo	50.4	51.2	50.0	47.9	49.6	47.0	**49.3**
A321	51.4	50.7	52.5	48.7	54.3	53.0	**51.8**
A321neo	56.4	58.2	58.0	53.7	57.7	58.5	**57.1**
A330-200	88.7	87.4	82.7	79.3	94.3	83.0	**85.9**
A330-200 Freighter	-	-	-	-	94.4	-	**94.4**
A330-300	100.8	95.6	96.0	93.3	104.4	99.0	**98.2**
A330 900 (neo)	-	-	-	-	110.4	-	**110.4**
A350-900	153.1	156.0	152.1	136.7	150.6	148.0	**149.4**
A350-1000	-	-	-	-	169.0		**169.0**
A380	217.6	245.7	231.0	196.1	232.0	193.0	**219.2**
Boeing							
737-800	46.3	45.0	47.9	44.4	48.0	46.0	**46.3**
737-900ER	50.6	45.6	49.9	46.9	52.0	46.8	**48.6**
737 Max 8	52.4	52.3	52.1	49.2	51.5	50.3	**51.3**
737 Max 9	-	-	-	-	52.5	-	**52.5**
747-8I	159.9	150.1	164.5	160.7	-	143.0	**155.6**
747-8F	187.7	180.2	173.9	170.7	193.2	192.0	**183.0**
777-300ER	158.2	155.4	159.5	148.1	161.3	141.0	**153.9**
787-8	120.0	118.6	122.8	113.1	122.3	114.0	**118.5**
787-9	148.1	148.5	143.6	136.6	144.8	140.0	**143.6**
787-10	-	-	-	-	150.5	-	**150.5**
ATR							
ATR42-600	16.0	16.5	16.6	14.3	15.7	18.0	**16.2**
ATR72-600	20.7	20.4	21.0	19.4	20.5	19.3	**20.2**
Bombardier							
CRJ700	25.9	24.5	24.5	21.1	25.9	22.7	**24.1**
CRJ900	28.4	25.6	24.8	24.5	28.6	25.4	**26.2**
CRJ1000	30.5	25.8	28.3	27.2	29.0	28.2	**28.2**
Q400	23.0	21.5	20.0	18.5	21.6	19.6	**20.7**
Embraer							
E175	29.3	29.4	27.7	26.8	30.4	27.5	**28.5**
E190	33.5	34.3	32.3	30.1	32.7	29.8	**32.1**
E190-E2	-	-	-	-	34.1	34.9	**34.5**
E195	35.8	34.7	34.2	33.1	34.5	31.0	**33.9**
Sukhoi							
SSJ100	24.9	26.1	25.1	23.2	21.8	18.6	**23.3**

New aircraft lease rates ($'000s per month)

Model	Avitas view	CV view	IBA view	ICF view	MBA view	Oriel view	Range
Airbus							
A220-100	240-260	235	260	204	239-262	280	**204-280**
A220-300	280-300	280	290	284	276-303	305	**276-305**
A319	260-280	270	265	242.3	257-283	230	**230-283**
A319neo	-	-	-	-	266-293	-	**266-293**
A320	295-315	320	300	323.5	322-353	335	**295-353**
A320neo	350-370	350	340	356.9	349-383	350	**340-383**
A321	350-370	375	360	392.8	386-424	390	**350-424**
A321neo	380-400	420	390	442.1	404-444	430	**380-444**
A330-200	700-740	670	640	686.1	684-745	700	**640-745**
A330-200 Freighter	-	-	-	-	657-715	-	**657-715**
A330-300	730-770	785	690	768.5	765-833	760	**690-833**
A330 900 (neo)	-	-	-	-	801-872	-	**801-872**
A350-900	1,050-1,150	1,100	1,080	1,096	1,098-1,195	1,075	**1,050-1,195**
A350-1000	-	-	-	-	1,233-1,342	-	**1,233-1,342**
A380	1,620-1,720	1,950	1,950	1,503	1,692-1,842	1,695	**1,503-1,842**
Boeing							
737-800	310-330	345	320	361	331-364	340	**310-364**
737-900ER	330-350	365	330	374	358-394	355	**330-394**
737 Max 8	360-380	365	350	395	358-394	350	**350-395**
737 Max 9	-	-	-	-	368-404	-	**368-404**
747-8I	1,064-1,264	1,050	1,200	990	-	1,075	**990-1,264**
747-8F	1,370-1,570	1,350	1,280	1,178	1,341-1,460	1,550	**1,178-1,570**
777-300ER	1,100-1,300	1,200	1,254	1,178	1,134-1,234	1,050	**1,050-1,300**
787-8	815-915	875	930	925	855-931	845	**815-931**
787-9	1,000-1,200	1,100	1,090	1,066	1,017-1,107	950	**950-1,200**
787-10	-	-	-	-	1,053-1,146	-	**1,053-1,146**
ATR							
ATR42-600	120-130	138	153	117	119-131	145	**117-153**
ATR72-600	175-185	180	178	144	156-172	155	**144-185**
Bombardier							
CRJ700	165-185	220	175	153	184-202	200	**153-220**
CRJ900	195-215	235	193	170	202-222	225	**170-235**
CRJ1000	220-240	235	213	182	202-222	255	**182-255**
Q400	180-200	195	180	140	165-181	170	**165-200**
Embraer							
E175	205-225	240	218	230	211-232	235	**205-240**
E190	245-265	275	244	260	230-252	240	**230-275**
E190-E2	-	-	-	-	239-263	255	**239-263**
E195	245-265	280	253	211	248-273	245	**211-280**
Sukhoi							
SSJ100	185-205	190	190	165	153-166	165	**153-205**

HIGH ACHIEVERS FLY E2

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