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Airlines and lessors press reset button for 2021 and beyond

The aviation industry has gone through a great deal of pain to reposition for a post-pandemic world.

The decision by the organisers of the Paris air show to cancel the semi-annual gathering in June 2021 may have been driven by the logistics in the face of the uncertainty of the Covid-19 pandemic but it is as good a symbol as any that demand for new aircraft is going to be subdued for a long time.

The cancellation is an acceptance that previous predictions for the aviation industry's growth need to be scrapped and resubmitted, that the super cycle which had driven the industry to new heights has come crashing down.

This is not news to airlines and lessors which spent much of last year repositioning for the drastically altered demand landscape created by the Covid-19 pandemic.

Beyond the immediate priority of restructuring of debts, conserving cash and renegotiating lease terms, airlines and lessors spent much of 2020 in what is likely to have been the complex task of rescheduling and/or slashing their order commitments.

Older aircraft and large widebodies were retired or placed in long-term storage.

Airlines have sought to reduce their capital expenditure commitments, while also adjusting to the subdued future demand horizon.

Lessors have in turn cancelled orders where customers are unwilling or unable to take delivery.

Boeing has logged 548 cancellations this year.

Notable among these are Avolon which has cancelled more than 100 Max orders since the start of the crisis. CDB Aviation which scrapped 29 orders and deferred another 20 to leave it with no deliveries until 2024.

Air Lease has cancelled 32 Max orders.

Airbus total cancellations by the end of November stood at 84, consisting of 33 A220s, 22 A320neos, seven A321neos, five A330-900s, 11 A350-900s and six A350-1000s.

By AFJ account, Embraer recorded 20 orders while ATR had five orders. No cancellations were recorded.

As delivery pipelines have shrunk, lessors have been able to seal attractively priced, opportunistic sale and leaseback transactions with typically good credit airlines.

SMBC Aviation Capital acquired 16 A320s from Easyjet via sale and leasebacks last year. CDB Aviation has agreed Airbus sale and leaseback deals with Wizz Air, SAS, TAP Portugal and Frontier Airlines, and transacted Boeing deals with United Airlines and Westjet.

In a third-quarter earnings call, AerCap chief executive officer, Aengus Kelly, said that as production and delivery ramps up from the original equipment manufacturers (OEMs), sale and leaseback demand will become much more urgent.

"Right now, we have all-time lows of deliveries from Boeing and Airbus. Boeing isn't delivering anything really except a handful of widebodies a month and Airbus's own production is significantly down," he says.

Kelly is confident that OEMs will increase production rates in 2021 and there will be a more pressing demand for sale and leaseback deals.

"The leverage dynamic will be more in our favour," he adds.

In other cases, the reset has been less consensual.

Norwegian torpedoed its entire 97 Boeing order in a blaze of litigation in June, highlighting reliability issues with the 787 and 737 Max for its decision.

AMCK Aviation is being sued by Frontier Airlines over its withdrawal from a sale and leaseback agreement for six A320s.

Airline restructurings in Asia have been particularly ugly. *Reuters* reports that Airbus stands to lose more than $5 billion-worth of aircraft orders if Air Asia X's debt restructuring scheme goes through as planned.

BOC Aviation is seeking to gain more leverage in the restructuring process via a debt-for-equity swap, in what would be a re-run of its acquisition of a major stake in Norwegian last year.

Malaysia Airlines' showdown with lessors last year almost led to the carrier making legal history by seeking to restructure in the UK.

The aircraft OEMs have been heavily impacted by the industry reset, particularly Airbus and Boeing, with a wave of cancellations and deferrals that have not been offset by new orders. Fitch Ratings expects Airbus's 2020 deliveries to be between 500 and 550 units, the lowest level since 2011.

In subsequent years, it predicts annual deliveries to increase at a low double-digit percentage rate, driven primarily by the A320-family product line, although this base case assumes no repeat of the widespread restrictions on flights experienced in the second quarter of 2020, as well as the containment of Covid-19 via a widely available vaccine in 2021.

Fitch notes the Airbus backlog remains very strong at more than 7,400 units, although the ratings agency does not expect 2019 aircraft delivery rates to be reached until at least 2025.

Boeing needs to deliver its inventory of more than 450 completed 737 Max aircraft, a process that will last into 2022.

The manufacturer can take some solace from the US recertification of the 737 Max in November. Boeing has already gained a 75 Max order from Ryanair since the types' return, while Alaska has ordered another 23.

The reset, while painful, will make the industry leaner and more disciplined as it prepares for the inevitable recovery, whenever that will come.

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Montana succeeds Weir at **American**

American Airlines has promoted Meghan Montana to the role of vice-president and treasurer.

She succeeds Tom Weir, who has announced his retirement from American after 20 years with the company.

Montana is responsible for the airline's treasury activities, including corporate finance, global banking and cash management, as well as fleet transactions, asset management, insurance and fuel procurement. She will report to American's chief financial officer, Derek Kerr.

Montana joined American in 2018 as managing director and assistant treasurer. She has been instrumental in American's response to the Covid-19 pandemic, helping Weir arrange more than $20 billion in financing in 2020 to strengthen American's financial position.

Previously, Montana was responsible for the North and South American Transportation and Aviation sector coverage efforts at Standard Chartered Bank, advising the bank's corporate clients across their capital structure and treasury needs. She has more than a decade of Wall Street experience leading and advising large corporate relationships at complex global institutions including Standard Chartered, as well as Deutsche Bank and the Royal Bank of Scotland.


Meghan Montana

Rostrum Leasing names CEO

Rostrum Leasing has announced Mat Burris as its new chief executive officer (CEO).

Burris started his career at PwC as a senior audit consultant in 1994 before joining Corus Group in 2000 as a finance manager.


Mat Burris

He then joined TES Aviation Group in 2001 as a finance manager before being the chief financial officer, chief operating officer and, eventually, the CEO in 2014.

Rostrum Leasing commenced operations in December 2017 and initially acquired a fleet of 39 Boeing 737-300 and 34 CFM56-3 spare engines from Southwest Airlines.

From this initial acquisition, the Dublin-headquartered leasing firm developed its primary platform of CFM56-3s and 737-300s.

Rostrum Leasing is also actively exploring adjacent markets to its primary leasing platform such as freighter leasing.

Jeffrey Wool joins **Holland & Knight**

Holland & Knight has appointed Aviation Working Group (AWG) secretary-general, Jeffrey Wool, as its director of international law and policy.

Wool took his post on 1 January 2021. He was previously with law firm Blakes.

He will continue to serve on secondment as secretary-general of AWG, a not-for-profit international industry group which works on the development of policies, regulations and rules designed to facilitate advanced international aviation financing and leasing.

Since AWG's inception in 1994, he has coordinated its policy development and government consultations on a wide range of commercial and international law and regulatory issues.

Holland & Knight will serve as AWG's international counsel.

Steven Sonberg, the managing partner, Holland & Knight, says: "We are excited about having Jeffrey in this important role at the firm and supporting AWG at this pivotal time for the aviation financing sector as it deals with the range of issues related to the pandemic."

Air Canada gets new CFO

Air Canada has promoted Amos Kazzaz as executive vice-president and chief financial officer, effective 15 February 2021.

Kazzaz is currently the airline's senior vice-president, finance. He joined Air Canada in 2010 as vice-president, financial planning and analysis, and became senior vice-president, finance, in 2015.

He previously held senior executive roles within the airline and transportation sector, including a 24-year career at United Airlines with several executive positions in finance, planning and cost management.


Amos Kazzaz

Seraph Aviation appoints acting general counsel

Hannah Moran-Ellis has joined Seraph Aviation as acting general counsel.

Moran-Ellis is a finance lawyer specialising in aviation. She has extensive experience with unsecured corporate financings, secured aircraft financings and all aspects of operating lease transactions. She joined the firm from Emirates, where she acted as the legal adviser for five years to September 2020. Before that, she spent almost four years at Bird & Bird as an associate.

Moran-Ellis started her career at Clifford Chance as a solicitor and had secondments at Airbus and RBS Aviation Capital.


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WFW boosts China coverage with Hong Kong aviation team hire

Watson Farley & Williams (WFW) has hired the Berwin Leighton Paisner (BLP) aviation team in Hong Kong, led by William Ho and Jackson Chow.

Ho has experience advising on the full spectrum of aircraft transactions and structures and is recognised for his expertise by Chambers Asia Pacific and Legal 500 Asia Pacific. He has had a leading role in Hong Kong tax reform for the aviation leasing industry.

Chow specialises in structured asset finance and leasing with a special focus on the aviation sector. He is also recognised as a leading lawyer for aviation finance by Chambers Asia Pacific and Legal 500 Asia Pacific.

Also joining WFW are senior associate Carmen Chien, associate Alfred Yu and legal manager Vivienne Zhao.

WFW has lawyers with both aviation finance and disputes expertise in Hong Kong, but the new team are the firm's first lawyers there dedicated to the sector.

Ho's team is considered as a leader in the Chinese aviation finance and leasing market. The team also advise on Jolco transactions, French tax leases, European ECA- and US Ex-Im-backed aircraft financing, pre-delivery financing, asset-backed securitisations, aircraft secured bond transactions and portfolio sales, syndicated portfolio loans, PTC SPEC

William Ho

Jackson Chow

structured financings and aircraft and engine operating lease transactions.

"Chinese airlines, lessors and banks are amongst the most active players in the sector. Bringing on board a team of talented sector-specialist lawyers is an absolutely fantastic opportunity, further strengthening our profile and capabilities across the Asia Pacific region," said Singapore-based global aviation sector co-head Charles Viggers.

Hong Kong office Head Madeline Leong commented: "Expanding our presence in China in the aviation space complements our highly regarded maritime offering. Our new aviation team enhances WFW Hong Kong's presence and profile in sector across the Asia Pacific region and also helps introduce our existing capabilities and services to a wider audience".

Ho and Chow moved to BLP's Hong Kong office in July 2016. Both were hired as part of a significant lateral hire of a team of five lawyers from William KK Ho & Co, an independent boutique firm specialising in asset financing for aircraft and ships.

Flynn O'Driscoll promotes McDermott

Law firm Flynn O'Driscoll has promoted Claire McDermott as partner.

McDermott is a key member of the aviation and asset finance team and advises clients on all aspects of aircraft finance and leasing transactions, including leasing, debt financing and export credit agency supported transactions.

Claire McDermott

She has acted for banks, leasing companies and investors in relation to complex cross border aviation finance and leasing transactions including those supported by the ECAs and Ex-Im Bank.

McDermott joined Flynn O'Driscoll as a trainee solicitor in 2010 having worked in The Coca-Cola Company's legal department as a legal assistant. She was admitted as a solicitor in 2014 and is also qualified in England and Wales.

Veteran Coviello joins **Contrail**

Contrail Aviation Support has appointed Michael Coviello as the company's vice president of transaction management.

In his new role, Coviello will manage and optimise all aspects of the deal flow transaction process, from contracts to third parties liaising to technical, in an effort to support the origination team and further drive transaction volume.

Coviello, a commercial aircraft transaction veteran executive of 42 years, was most recently vice president aircraft trading of Aviation Capital Group (ACG). Prior to that he served as the lessor's vice president portfolio management.

Michael Coviello

He has also held notable leadership positions GMT Global Republic Aviation, Mountain Capital Partners, AirCapital Aviation Services, Back Aviation, Republic Financial Corporation and Tombo Aviation (a Mitsui Company).

Contrail Aviation Support is worldwide supplier of surplus and aftermarket commercial jet engine components as well as asset leasing and acquisitions.

Embraer turns its attention to cargo market

The Brazilian OEM is working on two different projects – a turboprop and a freighter conversion programme – but also needs more E2 sales.

Embraer is studying the cargo market with a view to launching a freighter conversion programme, *Airfinance Journal* can exclusively reveal.

The Brazilian manufacturer aims to develop a secondary market for converted models in parallel to E2 jet sales, and was due to make a decision on a potential Embraer E-Jet freighter conversion in late December.

Embraer was unavailable for comment.

The larger E195 model was involved in Azul Linhas Aereas cargo transportation flights last year after Brazil's civil aviation authority granted exemption for the carriage of additional freight on Embraer passenger aircraft.

"The E190 conversion project is independent from Azul cargo flights," says one source with knowledge of the manufacturer's plans. "The idea behind the conversion programme is to get a long-term OEM [original equipment manufacturer] solution for those fleets," adds the source.

The Embraer E-Jet freighter conversion will focus on the E190 and E195 models as they fill a gap between the Boeing 737-300 and ATR72 models.

Embraer is not studying potential conversion for the smaller members of its fleet because they would lack clearance between the main deck cargo door and the engine, *Airfinance Journal* understands.

The E190 model is the second most successful aircraft in Embraer's product line after the E175. As of 30 September, Embraer had delivered 565 E190s and had a backlog of three units.

Potential feedstock of E170/175 aircraft is another consideration, although the Brazilian manufacturer continues to sell the E175 model and had a backlog of 153 aircraft and 261 options at the end of the third quarter.

There is a minor conundrum around E195 feedstock. The model is more desirable in some markets (especially China) because of payload and requirements for engine clearance, but it has sold the least of all the E1 variants.

From a residual value perspective, a freighter conversion would be beneficial, especially if demand exceeds supply.

Airfinance Journal understands that if Embraer greenlights the freighter conversion project, the expectation is that a prototype would be ready to fly by the end of 2022.

Initial passenger-to-freighter conversions are often subject to delays, but customers could start receiving the converted models in 2023.

The Embraer proposal could be a good proposition in terms of volume and speed when compared with turboprop freighters. But targeting the lower end of the market will be challenging.

ATR has had a market presence in cargo conversions for almost two decades. The European manufacturer announced bulk freighter (tube version) and unit load device freighter (large cargo door version) conversion programmes at the 2002 Farnborough air show.

> *"The Embraer E-Jet freighter conversion will focus on the E190 and E195 models as they fill a gap between the Boeing 737-300 and ATR72 models."*

The ATR72 model is a 32-year-old aircraft. The oldest ATR72-500s are 23 years of age, and are prime candidates for conversion.

The turboprop conversion market has been relatively sluggish, but increasing availability over the past few years, especially for the ATR72-500, has helped values to enter the "conversion zone".

ATR believes the eight-tonne segment will become the reference point for the market while three- to five-tonne capacities will significantly reduce because of a lack of feedstock.

The ATR models would probably beat the E-Jets in terms of fuel burn and maintenance costs in the 70- to 80-seat market segment.

However, Embraer will only face relatively small, fragmented and ageing fleets of BAe 146QTs, 737-200s, 737-300s and DC-9s as a potential competitor in the 100- to 120-seat conversion market.

The passenger-to-freighter E190 conversion would have a maximum structural payload of about 11 metric tonnes.

As with any conversion programme, a potential launch will depend on three factors: market demand, feedstock availability and asset residual values.

The E195 was involved in Azul Linhas Aereas cargo transportation

E190 values

A potential cargo conversion would need values in the conversion zone to make the project viable. Sources say asset values have come down since Covid-19 started.

One trading source says values for some Embraer aircraft were in the $9 million to $12 million range in April, compared with $15 million to $20 million about 18 months ago.

Recent offers were as low as $5 million to $6 million, although the aircraft may have been in "as-is" status.

"If a half-life aircraft is priced around $8 million, then a run-out model in the $4 million range makes sense," says the source.

There are only thin premiums for vintage in the current E-Jet market, says another source, adding that maintenance condition is the real differentiator.

One recent transaction saw an aircraft selling at less than $4 million, although the engines were run-out and the life-limited parts were down to a quarter-life remaining.

Airfinance Journal's Fleet Tracker shows that 533 aircraft were in service or stored/in transition as of 31 December.

Assuming a conversion programme sees the first redelivery in two years' time, candidates would include models that were built between 2005 and 2008. This represents about 120 potential aircraft.

The E190/E195 current average fleet age is about 10 years, but, importantly, 50% of the current fleet is already 10 years old or more. In two years' time, about 75% of the fleet will be more than 10 years of age.

It remains unclear at this stage which units would be the first to be converted; however, historically conversions tend to start about 12 years old and then rise to an average of 18 to 19 years as programmes mature.

Turboprop project

Rodrigo Silva e Souza, commercial aviation marketing vice-president, Embraer, believes a new turboprop, which is currently under study by the Brazilian OEM, could generate hundreds of sales in the US market.

Souza also sees the new turboprop replacing 50-seat regional aircraft in the USA.

"In some cases scope clauses are too limited to 50 seats, the size of aircraft that can be flown by network airlines," he says.

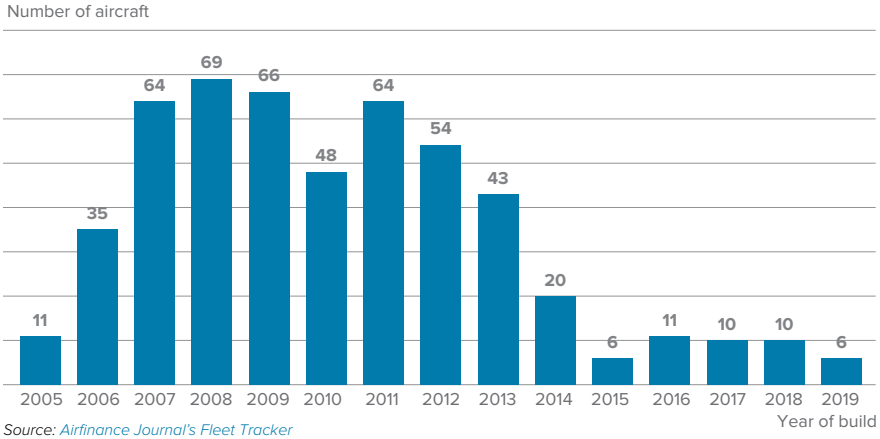
"The turboprop can replace them with a more comfortable cabin and more efficiently. We are considering a cabin that is as comfortable as an E-jet.

"It is a different level of proposition that may take airlines to rethink this paradigm of the turboprops in the USA. If this happens, we are talking about additional hundreds aircraft for the business case of this programme."

Embraer's latest market 10-year outlook forecasts 1,080 new turboprops to be delivered through 2029.

The OEM says the majority will be to airlines in China/Asia-Pacific (490 units) and Europe (190 units), absorbing that demand.

E195 Fleet age profile



Source: Airfinance Journal's Fleet Tracker

> *"There will be a restoring period through 2024 followed by a period of growth."*
>
> **Rodrigo Silva e Souza**, commercial aviation marketing vice-president, Embraer

The new turboprop would be between 70 and 100 seats.

"We see a reasonable demand for turboprops," says Souza, adding that those aircraft play an important role in connectivity.

"The current offering is old technology and there is a big opportunity to bring an aircraft that is more efficient, faster and more comfortable for passengers and more environmentally friendly," he says.

Souza adds that the new turboprop will replace 50-seater turboprops.

"The 50-seat turboprop is one of the markets we see for this aircraft," he says. He anticipates airlines upgauging their 50-seat turboprops with larger aircraft.

Speaking on the *Airfinance Journal* podcast, 'How Embraer will emerge from Covid-19', released in October, Souza said a new turboprop concept from Embraer could enter service as early as 2027.

10-year outlook

Embraer says the airlines' recovery period will be slower than previously anticipated in terms of revenue passenger kilometres (RPKs).

In its 2020 commercial market outlook that covers the period through 2029, the Brazilian OEM expects a 2.4% average growth rate versus 2.9% in its 2019 forecast.

It anticipates that global passenger traffic, measured in RPKs, will return to 2019 levels by 2024, yet remain 19% below Embraer's previous forecast through the decade, to 2029.

Embraer sees RPKs in Asia-Pacific growing the fastest (3.4% annually).

Souza says Covid-19 has "permanently skewed the RPK curve".

He says: "There will be a restoring period through 2024 followed by a period of growth, but smaller in terms of RPKs compared with previous forecast. In general, we see a 1% slower growth than what we had before."

Embraer sees a demand for 5,500 new deliveries between 2020 and 2030. About 20% are turboprops while 80% are regional jets up to 150 seats.

The OEM says that the forecast for the next 10 years anticipates 75% of that demand for aircraft replacement and 25% is driven by growth.

"This demand addresses the restoration of a network impacted by the Covid crisis," Souza says.

Embraer believes airlines will continue to right-size and shift to smaller capacity, more versatile aircraft to match weaker demand.

The global pandemic is causing fundamental changes that are reshaping air travel patterns, and Embraer believes regionalisation is another factor as companies seek to protect their supply chains from external shocks. This will bring businesses closer, generating new traffic flows.

Souza anticipates international business traffic will be impacted but he is more optimistic on domestic business traffic as well as passenger behaviour. He believes passengers will have a preference for shorter-haul flights because decentralisation of offices from large urban centres will require more diverse air networks.

The 10-year forecast anticipates 31%, or 1,710 new deliveries, from the Asia-Pacific region. North America and Europe follow with 29% and 25%, respectively, of the demand under the 150-seat market. Latin America and Africa represent 9% and 6%, respectively.

Qatar makes pitch to become leasing hub

Qatar's efforts to establish itself as an aircraft leasing and financing hub have progressed after Magi Aviation Capital decided to open a regional office in Doha, writes **Oliver Clark**.

Aviation finance specialist Magi Aviation Capital has established Magi Aircraft Management ME, a Qatar Financial Centre (QFC)-registered company which will be the focal point for Magi's origination and aircraft management activities in Doha, Qatar, and the wider region.

The office will also focus on the development of aircraft finance and leasing expertise in Qatar, working alongside QFC and other local partners.

Qatar is one of a growing number of jurisdictions seeking to attract lessors and capital and challenge the dominance of Dublin and Hong Kong.

Earlier this year, Malta established a taskforce to advise on changes to the country's legal system to attract leasing companies to open subsidiary offices.

India is seeking to establish an aircraft finance hub in the country's sole international financial services centre in Gujarat.

India's Department of Economic Affairs recently confirmed that operating, financial or hybrid leases of aircraft, engines and other parts will be considered "financial products" under an updated financial services framework.

They join others in Singapore, and in China across Shanghai, Shenzhen and the Dongjiang free-trade zone in Tianjin that offer favourable tax and legal incentives for lessors.

Closer to home, DAE Capital is based in Dubai while Kuwait is the headquarters for ALAFCO.

Sirius Aviation Capital, a new leasing platform led by former Ryanair chief financial officer Howard Miller and backed by one of Abu Dhabi's largest sovereign wealth funds was established in the Gulf state in December 2019.

Investment opportunity

Speaking on a QFC-organised webinar, called 'A New Frontier in Aircraft Finance', in November, Sean Cleghorn, chief executive officer (CEO) and co-founder of Magi Aviation Capital, said that the investment opportunities afforded by Qatar and its regulatory regime were important considerations in its decision to establish an office in the Gulf state.

"I cannot really think of any significant success that has been achieved without that support network, without that cooperation, without that local partnership."

Sean Cleghorn, chief executive officer (CEO) and co-founder, Magi Aviation Capital

He estimates that four carriers in the region – Qatar Airways, Turkish Airlines, Kuwait Airways and Oman Air – have $20 billion of combined aircraft orders that may be suitable for sale and leaseback transactions.

Globally, the top 40 airlines have $165 billion of aircraft orders, excluding $130 billion of core aircraft already owned, according to him.

"You can see it's a relatively modest proportion of that opportunity for an investor or financier within that region to grasp to create a scalable business," he says.

Cleghorn also emphasised the importance of creating an ecosystem that is conducive for leasing businesses, including a ready availability of qualified labour and support infrastructure.

"I think that's incredibly important for any location of a business such as ours which is why the decisions we have made over time have led to our establishment of the office in Doha," he says.

The need for local partners and suppliers is "absolutely critical", believes Cleghorn. He adds: "I cannot really think of any significant success that has been achieved without that support network, without that cooperation, without that local partnership."

He adds: "We certainly, and I suspect our peers, would look to be closer to the airlines, closer to our financiers, closer to the opportunities and transactions, closer to the sources of funding. Qatar for us definitely meets those requirements," he says.

"We need a supportive government, a supportive regime and a regime in which aviation can thrive," notes Cleghorn.

Fahmi Alghussein, CEO of Aventicum Capital, estimates there is about $100 billion of assets under management in aviation leasing, excluding asset-backed securities and assets such as engines and spare parts.

"I think Qatar is well positioned to capture a substantial portion of that," he says.

He emphasises the growth potential of carriers in the region. Africa, he says, will be a "fantastic opportunity" and Qatar's institutional investors, sovereign wealth funds and high net worth individuals are "well positioned to capture this opportunity".

Tax regime

Yousuf Mohamed Al-Jaida, CEO of QFC, noted that Qatar's legal regime basis in English law would be an integral factor for establishing a successful aircraft-leasing hub in the Emirate.

"The Qatar financial centre's legal regime is based on English common law and is well suited for non-regulated captive finance, and finance lease-related transactions, as it provides options for structural transactions in a manner that is commonly used in other global markets and utilised by the aviation sector," he says.

He adds that Qatar provides favourable tax treatments, more than 80 double-tax treaties worldwide and corporate entity

> *"Gone are the days when [there were a] totally exempt regime and no taxes. I think the world is changing."*
>
> **Sajid Khan**, a partner with PwC

options for potential lessors. A corporate governance regime for special purpose vehicles that are "investor friendly" is also available.

"Qatar is a signatory of the New York Convention and has a seat at the convention on international interests on mobile equipment 2001 and aircraft equipment protocol in Cape Town, which offers creditors standardised remedies and transparent insolvency practices," says Al-Jaida.

"Being part of these conventions paved the path for the growth of aircraft business in Qatar," he adds.

PwC has produced a report for the QFC into its offering for lessors and analysed any "gap assessment" with rivals such as Dublin, Hong Kong and Singapore, as well as regional competition from the UAE.

Sajid Khan, a partner with PwC, pointed out that lessors or financiers can chose between two regimes in Qatar: to be regulated under a standard tax system; or to opt for an exempt regime which provides an important "flexibility factor".

Legal entities and corporate governance

The QFC regime offers a number of flexible incorporation options to potential lessors who benefit from:

- limited liability to shareholders;
- no minimum share capital requirements;
- an ability to establish both conventional and sharia-compliant corporate structures;
- an ability to hold assets on behalf of third parties;
- for certain QFC special purpose vehicle (SPV) entities, no requirements to have an audit or file financial statements with the QFC Companies Registration Office and no requirement to hold annual general meetings;
- an ability to be exempted from tax; and
- the ability to carry out a wide range of activities to support the execution of different transactions.

Source: K&L Gates

He adds: "Gone are the days when [there were a] totally exempt regime and no taxes. I think the world is changing."

"I think the investors would like to decide for themselves what works best for them. I believe flexibility is fundamental and I think the way QFC has addressed that as part of its offering to the aircraft financing and leasing regime is by picking on the fact that we will offer investors a choice between what works for them," adds Khan.

He notes key changes shaping the international tax landscape: the OECD Action 1 initiative on the digitalisation of the economy; and Pillar Two, which involves the imposition of a global minimum tax.

While Khan says it was hard to predict the impact of these changes, he believes Qatar finds itself "in pretty good shape," because the QFC, unlike Dublin, is not within the EU.

"Hong Kong has a political cloud now from what is happening there with the Chinese oversight," he notes, adding: "So I think there is a unique advantage to QFC from that perspective."

Neighbouring regimes where there is no tax are "likely to be impacted much more heavily if a Pillar Two and global minimum tax package comes because QFC already has a light taxable regime", according to Khan.

"So I think whatever happens on that front, I definitely see the QFC has less to worry about than some of its counterparts that we benchmark," he adds.

Legal oversight

Sidanth Rajagopal, a partner at K&L Gates, which carried out a study into the QFC's legal and regulatory framework, says that the English common law regime in Qatar, afforded "very favourable" tax treatments.

He notes that Qatar has no restriction on foreign ownership, while offering access to various Islamic financing options, which provide a "very exciting" backdrop for a potential leasing company.

"As an underling point becomes quite clear that from an aviation sector ecosystem perspective, providing each of the lessors what they are commonly used to having access to in places like Ireland, and Hong Kong and Singapore, Hong Kong now possibly less so, is the fact that they have a clear legal regime available to them," he says.

Rajagopal also highlights laws governing the incorporation of legal entities in the QFC, ability to create limited liability structures and special purpose vehicles, a no minimum share requirement, sharia-compliant financing, and ability to set up bankruptcy remote structures.

"One of the big advantages that QFC would give would be access to local financiers and local lenders and local capital available for leasing companies," says Rajagopal.

Keystone international treaties in aviation financing and leasing

The state of Qatar is a signatory to the Cape Town Convention

- alternative A insolvency regime;
- irrevocable deregistration and export request authorisation (Idera);
- pricing on capital market financings of aircraft; and
- untested.

The New York Convention:

- enforcement of arbitral awards;
- untested since new arbitration law was published in 2017;
- QFC arbitration regulations and a proven record of enforcement of judgments against parties in the state.

Source: K&L Gates

He also points out that Qatar is a signatory to the Cape Town Convention ability for an aircraft owner to make an irrevocable deregistration and export request authorisation (Idera) over an eligible aircraft.

"From a dispute resolution perspective, many investors and financiers which may be testing it for the first time will benefit from the fact that the state of Qatar also has ratified the New York Convention on arbitrary award," he says.

"While it is untested because it was acceded to in 2017, the strong judiciary and the strong steps that the courts at the QFC have taken, coupled with the fact that an arbitrary award given by another court will be enforced by the state of Qatar and by the QFC by virtue of the New York convention should also add certain benefits and comforts from a dispute resolution perspective to the lessor leasing business and the lenders," adds Rajagopal.

John Gould, head of aerospace logistics and maritime at the Qatar Free Zones Authority, says the kingdom has two free-trade zones within 30 minutes of Doha.

A total of 30 million square metres are available for businesses to base themselves, of which one million square metres is dedicated to aerospace companies, adds Gould.

While the speakers on the webinar outlined the benefits for those wishing to base themselves in Qatar, no mention was made of the current economic and diplomatic embargo of the kingdom by other Gulf states, which has been in place since 2017 and could impact the QFC's desirability as a leasing hub.

Institutions regain their appetite

While the Covid-19 crisis initially had a chilling effect on institutional investors' craving for aviation assets, there is now optimism that demand will return, reports **Oliver Clark**.

The initial spread of Covid-19 and resulting national shutdowns had an immediate impact on investor appetite for aviation, being one of the most exposed sectors to the crisis.

Bank lending to the sector was severely curtailed, with only good credits and existing customers considered, yields on corporate debt blew out in the early weeks of the crisis and asset-backed security issuances dried up.

The hunger for aviation assets among institutional investors on the debt and equity side was equally impacted.

"Why were they a bit cautious during the crisis? Because if your regulatory authorities are investigating asset classes and you are doing aviation debt with a large portion of your portfolio then you are on their screen because the industry is heavily impacted by the crisis, everyone is looking to the airlines not just in Germany but across Europe," Stefan Futschik, head of private debt at Prime Capital, tells *Airfinance Journal*.

Prime Capital manages a total commitment of $1 billion in aviation-related exposure. The commitments are split across several managed accounts, all focused on aviation debt.

The majority of investments are allocated to senior secured loans and the remainder to mezzanine debt.

Futschik compares the crisis to that experienced in the shipping sector 10 years ago, with no one wishing to touch aviation for the first six months.

Now, however, the institutional investors he works with, typically pension and insurance companies, have more information. A number of airlines look likely to survive the crisis thanks to government support.

If anything, Futschik sees more opportunities now to generate the return that his investors required pre-Covid-19.

"We do not feel the pressure within our portfolio, but yes there are some opportunities in the market because all of these aircraft need to be financed, and currently the financing market is still dry and limited in terms of LTV [loan to value] and limited in terms of acceptance of some lessors and airlines.

"So the risk premium is different compared with six months ago when all of these airlines were able to find sufficient funding," he says, adding: "Sometimes we are going into the same tranche as banks or just into the bullet portion and the bank takes the amortising loan."

Futschik says that banks are again in the market with amortising loans of 60% to 70% loan to value with most airlines, and some already in the mid-70%. But many banks still cannot take the bullet portion "because they cannot understand or analyse the metal risk that we think we can do", he believes.

Because of the crisis and restrictions, such as Basel IV, banks are not able to lend at as high LTVs and they need to partner with institutional investors, adds Futschik.

Carsten Wriedt, senior director asset distribution aviation at NordLB, manages the selling of portions of its debt to institutional and bank investors as part of an origination and distribution strategy. He believes that the traditional model of banks partnering with institutional investors on airline and lessor deals is likely to recover.

"I think there will be lessons learned; everyone has his or her view on the market. We may see some changes in views on certain products, or certain structures and assets, but I would fully agree we will see a return of both debt and equity to the market," he says.

"The partnership on the institutional and equity side and the debt side is even more important these days because they are two investors doing a sanity check," adds Wriedt.

Frank Wulf, global head of aviation at NordLB, is equally upbeat on the return of institutional money.

"We have seen a big shift to Korea recently but we still have continental European institutions looking to invest in that.

"Big players in the Munich area are catering for that kind of investor. Typical German insurance companies are looking to invest either equity or debt. On the debt is where we would come in as underwriter, loan provider and cooperate investors looking to invest into debt products," he notes.

In the USA there is a bit of separation, with some players looking at only debt and others only at equity.

Wriedt says there is no indication South Korean investors have been overly burned by the current crisis.

"The Boeing 737 Max 8 will, once it is flying again, be a 'stellar asset for financing'."

Frank Wulf, global head of aviation, NordLB

"The ones I have been talking with, I am not sure if they have been experiencing major losses and burning their hands. It might get slightly warm under their feet, as we have seen airlines asking for deferrals or restructurings," he says.

Both Futschik and Wulf are clear that new-generation narrowbody aircraft remain popular with investors.

Prime Capital is focused on young narrowbodies, with selective exposure to the most liquid – ie, usually new-technology – widebody models. Each portfolio has an additional allocation to regional jets and turboprops, also with a clear focus on the liquidity of the respective aircraft.

On the narrowbody front, Wulf says it is clear the A320neo family is popular, while the Boeing 737 Max 8 will, once it is flying again, be a "stellar asset for financing".

Wulf's views on widebodies are more mixed. Some types, such as the 787-9 and A350-900, are holding up, he says, but 787-10s and A350-1000s may be viewed as more "nichey".

New investment quickens on the industry

Different countries have provided different levels of support for their airlines, but bankers and lessors believes new sources of investment in the sector is on the horizon. **Elsie Guan** reports.

Panellists at *Airfinance Journal*'s Asia Pacific 2020 virtual event held in November agreed that the commercial debt market will not recover soon from the Covid-19 pandemic-hit aviation industry.

Marilyn Gan, managing director, head of origination, Asia-Pacific Aviation, MUFG Bank recalled that the commercial bank debt is a very important player in this industry, but she acknowledged that at the moment it is dried up. "Other than a handful of players, you are not going to get much response from the commercial debt market," she says.

"My expectation is that the commercial bank market will take a lot of time to come back," says Richard Finlayson, managing director, head of transportation finance, Asia, Deutsche Bank.

"New investors will start probably more on the equity side in the near term and challenges will be around the leverage side going forward," Finlayson adds.

"You will have opportunities and players coming in and trying to fill the gaps where the spaces have been left. But the crisis is very systemic, there are so many sectors involved and airlines' behaviours are all government-led. It just seems that things are out of their hands," Gan says.

"In terms of new entrants, I think we will start to see it, although I do think the new numbers are coming in will be much fewer than the people who have exited," Gan says.

Gan also notes that green financing has yet to be embraced by the aviation market.

"From MUFG's perspective, environmental, social, and corporate governance is a very important part of our strategy going forward. But in aviation, I think the opportunities from ESG-type financing is still far away. We do have airlines and lessors who are interested in pursuing either sustainability-linked financing or our green bond, but the nature of the industry is such that I think it is still some way away," Gan says.

"One market that we see still being very active is the Chinese market, both in terms of the Chinese banks and Chinese lessors. A lot of lessors are interested in increasing their portfolios with Chinese airlines," Gan says.

The asset-backed securitisation (ABS) market for aircraft assets will take more time to be active again.

"It is hard for me to think when the ABS market will reopen for the commercial aircraft sector. Right now, there is nothing apparent in terms of structures that certainly needs to be fixed," says Chen Weili, head of commercial ABS, capital markets solutions, Standard Chartered Bank,Hong Kong branch.

"Take the global financial crisis as an example: it took six years for the ABS market to reopen. And I think there is a long period of time where the performance of both lease collateral and structure was going through slow recovery and revision," Chen says.

Chen also notes that aircraft ABS products are unique due to considerations about fleets and aircraft managers.

Phil Seymour, president and head of advisory of IBA, describes funding differentials across the airline market.

"A lot of airlines are pushing back deliveries. They are delaying things rather than taking things early. For those who are in need, then I do think there is a funding gap. Some airlines do want to take new deliveries but found that commercial banks just closed doors on them.

"Nothing personal. Banks just need to protect their own capital and protect their existing customers. New airlines or airlines without that history will just be turned away," Seymour says.

"Beyond anything the biggest difference is how governments have reacted in supporting their local airlines," comments Gary Fitzgerald, chief executive officer of Stratos.

"Government support is huge. Government support can come in lots of different forms but at this moment, cash is number one because lots of issues that airlines face are beyond their abilities to control. I believe government needs to step up for the worst affected industries," says Paul Sheridan, chief executive officer of AMCK Aviation Ireland.

"Now the issue of ABS of course is that a lot have been downgraded and the underline of investment is a little bit cautious which is totally natural. But what is important for our industry is not the volume, but the age, the type of the aircraft. It helps lessors recycle new and mid-life aircraft and helps them focus on new sales and leasebacks," says Fitzgerald.

"In the next six months, from my personal view, we will see new debt again. Debt-issuance ABS will be sort of approved structures," he adds.

Sheridan, though, thinks that many lessors will need to convince their shareholders and lenders.

"It will be a little bit slower to come back. You need to make a case why give money to aviation and aircraft leasing and where are the opportunities," he comments.

However, Fitzgerald thinks investment may return quicker than expected.

"What we have found is that financial institutions are facing a massive shortage of yields, they just cannot get products that make yields. I think the return will be quicker than we expected today. By the middle of next year, we might have very willing buyers for those just because they cannot get yields anywhere else," says Fitzgerald.

"It is still a relatively robust industry. There might be huge demands. Once the demand comes back, investment banks will come up with new structures that work for them," he adds.

Governments granted more than $160 billion in financial support to airlines between March and November.

This may not be enough, however, according to the International Air Transport Association (IATA), which argues that $300 billion of additional support will be required in the next few months for the majority of airlines to survive the Covid-19 crisis.

"The way these funds come is very important: we have direct loan and liquidity support, for example, through government guarantees, or they can come from equity stakes, or wage subsidies.

"As of today, two thirds of the support have come from direct aid, which means subsidies, direct loans, cash injections. Most governments believe that aviation is an important part of their GDP growth," says Natixis head of aviation finance, Asia-Pacific, Jean Chedeville.

COMAC has Airbus and Boeing in its sights

Can the C919 benefit from opportunities to narrow the gap with Airbus and Boeing, especially when the Covid-19 pandemic continues to affect the aviation industry? **Elsie Guan** reports.

China's Commercial Aircraft Corporation of China (COMAC) C919 performed at the Nanchang Flight Convention in the Jiangxi province on 31 October, representing the first public performance for the domestic passenger aircraft.

The C919, China's first manufactured narrowbody aircraft, conducted its maiden test flight in 2017. The aircraft has since completed a strict regiment of test missions covering various airport profiles to meet all regulatory standards.

"There are currently six aircraft involved in test flights for the airworthiness certificate process. The programme has received 835 orders and the first C919 will deliver this year," Yang Yang, deputy general manager of the marketing and sales department of COMAC, tells *Airfinance Journal*.

In April 2020, General Electric said that the manufacturer had received a licence to export engines for the C919 programme.

This was in response to persistent rumours that the USA was considering denying GE's latest licence request to provide the CFM LEAP-1C engine for the C919.

"Europe and the USA have full production chains in the aviation industry, but the Chinese domestic C919 still relies on imported technologies. So, in the long term, China still has a long way to go to develop a comprehensive aviation production chain," says Sean Hung, a vice-president and senior analyst of the financial institutions group of Moody's Investors Service.

Hung notes that the development of China's commercial aircraft sector is still in its initial stage and will face various challenges. Given the strong fundamentals of China's domestic recovery during the Covid-19 pandemic, combined by the factors when travel restrictions are eventually lifted, China should be in a relatively advantageous position to benefit from rebounding demand.

"I think it's going to be many years before an international market develops for the COMAC products, especially with the Covid-19 glut of available aircraft," says Michael Duff, managing director of *The Airline Analyst*.

"The question is whether the manufacturer can provide global support (technical/parts) to the airlines that operate it, assuming the aircraft is safe, meets the mission requirements (payload/range) and is priced appropriately. That is a large task," adds Duff.

"When we think of the COMAC product, we think safety, economics and comfort," says Yang. Initial demand for the C919 will come from the domestic market, although the OEM has plans to take the aircraft global.

"We are planning to market the product internationally", says Yang, noting that an international foray is expected within two to three years of the C919's first delivery, which is currently scheduled for late 2021, says the state-backed OEM.

Richard Wynne, managing director of China marketing of Boeing Commercial Airplanes (BCA), says: "We take the C919 as a serious competitor but we think the 737 Max can hold out against it."

But Wynne does not underestimate the aircraft type.

"The C919 will be a good competitor overtime. The question is what's the size of Chinese aircraft is initially going to the Chinese market and how quickly would it take for the aircraft to be certificated and be produced in volume."

Long-haul international traffic will recover last.China's domestic market was the first to recover from the fallout from Covid-19 in the second half of 2020. "China is less dependent on the long-haul international traffic, which we do think is the last to recover," Wynne adds.

Despite this, China still needs more widebody aircraft, according to Boeing's latest China market forecast.

"In last year's market forecast, 79% of China's fleet were single-aisles. Only 15% were twin-aisle aircraft. The new 20-year forecast projects a 4% to 5% rise in the number of twin-aisles. It is a fairly linear increase through that period. Still, there will be lot of single-aisle deliveries but there is very definite increase in the gauge because we think China needs more twin-aisles," says Wynne.

Boeing has pitched the 777X to the Chinese market.

"We haven't yet sold the aircraft to China's customers – we hope to do that. Those types of airplanes, especially the 787 models, fly domestically in China. We think of them as long-haul intercontinental airplanes. But the market connecting the big three cities in the east coast and major cities in central China is simply so big and there is enough air traffic capacity that China uses the widebody plane as much in the same way Japan has used them," says Wynne.

Last July, the International Air Transport Association released an updated global passenger forecast showing that the global recovery in traffic has been slower than expected. However, China's carriers continue to lead the recovery.

"We have positive views on China's aviation market, because of the robust economic growth in recent years. In the past five years, China's average annual growth rate of GDP was 7.8%. Both Boeing and Airbus take optimistic prospects for China's aviation market," says Yang.

> *If you asked before Covid-19, which segment would develop in China, I would have said long-haul intercontinental routes. This is because it was relatively less developed in China.*
>
> **Richard Wynne**, managing director of China marketing of Boeing Commercial Airplanes (BCA)

China's aviation market remains the second-biggest single market after the USA but could become the largest domestic market in the future.

The Covid-19 pandemic has significantly affected China's economy. But the pandemic has been under control and no confirmed cases have been reported for several months. Moreover, China's economy rebounded in the second quarter and reported a 3.2% year-on-year rise, according to Yang.

Aircraft original equipment manufacturers view China's interest in developing its own aircraft as a strong signal for the future.

"The Airbus-Boeing duopoly isn't likely to last forever. In general, we see China as the next major competitor, though in some 10 to 20 years' from now," according to Airbus, as cited by *CNBC*.

> *The question is whether the manufacturer can provide global support (technical/parts) to the airlines that operate it, assuming the aircraft is safe, meets the mission requirements (payload/range) and is priced appropriately. That is a large task.*
>
> **Michael Duff**, managing director of The Airline Analyst.

COMAC has distinct advantages in being state-owned as well as a massive domestic commercial aviation market.

But in its quest to compete effectively with Airbus and Boeing, it also faces challenges. The project has encountered technical difficulties. If the programme severely surpasses its original schedule, or is forced to stop, the company would suffer subsequent losses.

Then there is safety, which is vital on every programme, and COMAC has to ensure that the sustainability of the programme will not be impacted during the production and ramp-up stages.

The product has to address customer needs. If the product sits between market requirements, it will drive marginal interest.

Another challenge is competition. COMAC's market share, especially for international markets, relies on its ability to respond effectively to the competition from other major manufacturers.

Founded in 2008, COMAC has two types of aircraft (C919 and ARJ21) as well as the CR929 model in development, a joint-venture programme with Russia.

China's big three carriers – Air China, China Eastern Airlines and China Southern Airlines – have each ordered 35 ARJ21s. All three carriers expect their orderbooks for the type to be delivered between 2020 and 2024.

As of 4 December 2020, COMAC had delivered 41 ARJ21s to seven customers: Air China, China Eastern Airlines, China Southern Airlines, Chengdu Airlines, Jiangxi Airlines, China Express and Genghis Khan Airlines.

"To date, the ARJ21 has received 660 orders. The aircraft has transported 1.17 million passengers. The operating performance of ARJ21 has driven more confidence from the market," says Yang.

He reveals that COMAC may soon unveil two new customers.

In 2017, Russia's United Aircraft Corporation (UAC) and COMAC set up a joint venture called the China-Russia Commercial Aircraft International Corporation, which manufactures the C929, a widebody aircraft.

China aims to start delivering the CR929 in 2023, and build 1,000 units by 2035, according to Chen Yingchun, COMAC chief designer.

"According to our prediction, the overall global market demand on widebody aircraft from 2023 to 2045 will be about 10,000, of which 989 orders will be for the CR929," Chen said. The CR929 will be able to operate the majority of China's current air routes and serve transcontinental routes too, such as connections to the eastern coast of North America, according to Chen.

Boeing 737 Max returns to service

China's aviation regulator has yet to allow Boeing's troubled 737 Max to fly, despite the US lifting a ban on commercial flights. Other significant concerns remain, including production and lease rates that make sense, writes **Dominic Lalk**.

After a grounding that lasted nearly 21 months, in early December Brazilian carrier GoI became the first airline to resume Boeing 737 Max operations. The same day, United Airlines made history by being the first airline to take delivery of a new 737 Max aircraft since the Ethiopian Airlines accident in March 2019 that halted production and forever changed Boeing's fortunes.

In November, the US Federal Aviation Administration cleared the 737 Max to fly again. A few days later, the European Union Aviation Safety Agency (EASA) agreed that the Max was "safe to fly". EASA, however, did not approve the Max's return to the skies just yet. That is expected to follow in January.

China uncertainty

The Max's future in China, which was the first country to ground the programme in March 2019, is still unclear – in what could have a significant impact on Boeing's business.

> *"Lessors will definitely struggle to place Max aircraft given the oversupply. There will be a large gap between placed aircraft and SLB aircraft."*
>
> **Peter Huijbers**, former CASL chief executive

Boeing Commercial Airplanes managing director for China, Richard Wynne, says that the original equipment manufacturer "has been actively cooperating with Chinese regulators in terms of technical support, but the time for the plane's return to flight in China's airspace will be determined by Chinese regulators".

The question for the Civil Aviation Administration of China is whether it can remain independent of political influence and make decisions on aviation safety alone, especially given China's own foray into aircraft manufacturing, most notably through state-backed COMAC.

"We cannot deny that the Max is embroiled in the political schism between the two countries," says Shukor Yusof, founder of aviation consultancy Endau Analytics. "Beijing will use whatever leverage it has to ensure it stays in the game and be victorious in the end."

Boeing had delivered 96 737 Max aircraft to China before the grounding order took effect. In 2018, the manufacturer opened its first completion and deliveries centre in Asia in the Chinese port city of Zhoushan. The facility was specifically designed to accommodate projected demand from Chinese airlines for 737 Max aircraft.

Production rate and whitetails

Boeing hopes to increase gradually the 737 Max production rate to 31 aircraft a month by the beginning of 2022, with further gradual increases to correspond

"Take the official figure and halve it – that usually gets you pretty close to the real number."

Stuart Hatcher, chief revenue officer IBA, ISTAT certified senior appraiser

with market demand. Boeing once sold the Max against a production rate of up to 57 aircraft a month.

Experts find this too optimistic. "Take the official figure and halve it – that usually gets you pretty close to the real number," says IBA's chief revenue officer and ISTAT certified senior appraiser, Stuart Hatcher.

"When I say a rate of 15 per month, I'm also considering that they still have 700 or 800 already built aircraft that they need to still deliver, including some 380 parked with operators worldwide and another 400 or so parked across the west coast of the USA," he adds.

"They still have to focus on getting those aircraft back into the air first, so realistically they shouldn't be producing any new aircraft at all for quite some time.

"It's going to take close to a year getting those 700 to 800 back up and running. A rate of 15 could be even optimistic from that point of view. I could imagine that 30 could be perfectly reasonable once they get all those parked aircraft back into the air."

Shinichiro Watanabe, Sumitomo Mitsui Finance & Leasing (SMFL) managing executive officer and head of the transportation business unit, agrees, noting that affiliate SMBC Aviation Capital (SMBC AC) has deferred 69 737 Max aircraft.

"We deferred to after 2025 simply because we don't see any demand. I agree with Stuart [Hatcher], the rate will be quite low. I think 31 divided by two is a good number but maybe the actual rate should be even smaller than that, 10 to 15 possibly," says Watanabe.

Peter Huijbers, founder and principal of consultancy PH Aviation (and former CALS chief executive officer), thinks those numbers are still too high.

"I'll play devil's advocate. I think it's going to be a lot lower, more from a supply chain management perspective. From a purely commercial point of view, if I were a supplier to Boeing and, contrary to our original agreement, Boeing is now asking me to only deliver and supply maybe 20% of the original order volume, then why would I start this whole thing up again?

"Aside from the legal perspective, it's a pain to restart a supply chain. There might be more effective alternatives to produce," says Huijbers.

Leeham News founder and managing director, Scott Hamilton, does not believe Boeing will clear its 737 Max inventory for two years, which is twice the amount of time the OEM forecasts.

"I think it is extraordinarily optimistic," says Hamilton. He notes some aircraft in that inventory are now cancelled orders, or whitetails, and some aircraft in that inventory were destined for airlines which no longer exist.

Lease rates

Lease rates and market values of 737 Max programme aircraft have undoubtedly taken a nosedive, first from the prolonged grounding and more recently from the long-term effects the Covid-19 crisis will have on demand.

"Even by the middle of 2018, lessors were already having problems placing the 737 Max. The lessors were having to go to weaker and weaker airline credits to place their Maxs, and for weaker and weaker lease rates. We were seeing Maxs by the end of 2018 structured way into the higher 200s and stretching further down. I've seen lease rate placements of $270,000 and $280,000 a month," says IBA's Hatcher.

"Then 2019 came around and even before the grounding took effect many people were saying, 'crikey, why do I need this when I can get a perfectly good -800?' In reality you can't really go too much lower than the mid- to high-200s, otherwise it would basically be free money; it becomes very tricky," he adds.

"There has been quite some spread on the pricing before the grounding and that will continue once the aircraft gets back into service. I'd say generally single placements will be in the mid- to high-200s and sale and leasebacks [SLB] in the high-300s. It's a very large range; it's one of the trickier things to put an exact number to," says Hatcher.

Huijbers agrees. He, too, believes there will be significant variations in 737 Max lease rates.

"The lessor who needs to place this aircraft will definitely struggle given the over-supply and therefore I would expect a very large gap between placed aircraft and SLB aircraft," he says.

"SLBs will almost certainly produce higher lease rentals but direct placement will be very difficult. However, for 737 Max already directly committed by airlines there are alternatives: for example, the Jolco [Japanese operating lease with call option] market isn't dead yet. We've seen much lower demand but there's still some demand there and we could offer 737 Max Jolco financing solutions," says SMFL's Watanabe.

Avitas's senior consultant, Kimberly Bergin, says that rentals for new 737 Max 8 aircraft would likely be in the range of $260,000 to $280,000 a month, which represents a reduction of about 10% to 15% from pre-Covid lease rates.

Similarly, current market values for new-built 737 Maxs have bottomed out to about $43 million from more than $48 million at the beginning of 2019.

Cancellations

Leasing companies were vital in 2020 to keep some momentum going on 737 Max transactions. Despite cancelling hundreds of Max orders throughout the year, lessors came to the rescue of their cash-strapped airline customers – and Boeing – by agreeing to new 737 Max sale and leasebacks.

Chinese bank-backed BOC Aviation and CDB Aviation offered the largest 737 Max sale and leaseback bailouts, including new deals with United Airlines, Westjet, Icelandair and TUI.

Despite these notable deals that offered some much-needed reprieve to the Max programme, airlines and lessors cancelled more than 1,000 737 Max aircraft since the grounding, including ASC 606 (accounting) removals. Others have deferred their commitments "into the horizon", which usually means no fixed delivery dates agreed before 2026. Contractual clauses allowed for this if orders were not delivered within a one-year period from their initially agreed delivery dates.

Boeing listed 4,039 unfilled orders for 737 Max programme aircraft as at 30 November, a figure that does not include a top-up order placed by Ryanair which grew that carrier's Max backlog to 215 aircraft on order.

That backlog does, however, include a lot of "shaky" and "totally uncertain" orders, say experts, pointing particularly to 755 undisclosed orders, 237 aircraft from Lion Air, 125 from now-defunct Jet Airways, 129 from Spicejet and 92 from Norwegian, to name just a few.

Lessors account for a large chunk of 737 Max backlog. Notable remaining commitments as at 30 November include orders from Aercap (71), Air Lease (113), Aviation Capital Group (87), BOC Aviation (55), CDB Aviation (72) and SMBC AC (101).

AFIC eyes **product innovations**

Bob Morin's team is not only ready to increase capacity to support Boeing deliveries, but also seeks to introduce more products to consolidate its number one status in the aircraft finance insurance world.

Adaptability has been key for the Aircraft Finance Insurance Consortium (AFIC), the insurance-based supported finance structure developed by Boeing and Marsh, especially due to the two key industry events over the past two years: the grounding of the Boeing Max family of aircraft and the Covid-19 pandemic.

But Robert Morin, AFIC's managing director and transaction and business development leader, recalls that when the new insurance product formally launched on 5 June 2017, he had a short time to prepare to join his new employer.

AFIC, an alliance of insurers – Allianz, Axis Capital, Sompo International (formerly Endurance) and Fidelis – which provides lenders with loan or bond guarantees for Boeing commercial aircraft sales, took about two years of preparatory work before launching.

The timing was not accidental.

Ex-Im Bank stopped authorisations in July 2015 and it took almost four years, until May 2019, for the US Senate to restore a functioning quorum of the bank's Board of Directors, without which, Ex-Im Bank was unable to approve deals larger than $10 million.

"Through AFIC, the idea was to develop a private sector version of the Ex-Im Bank," says Morin. This private sector alternative has been considered as a complementary financing tool to export-credit guarantees but was "never envisaged to replace Ex-Im Bank".

Boeing Capital has a strong reputation for developing new sources of financing for its products.

"This time, Boeing Capital took a broader view. In a way, AFIC is just an extension of Boeing Capital's processes, as Boeing was trying to get the entire insurance industry interested in financing Boeing aircraft," says Morin.

"In the Boeing aircraft financing tool box, AFIC is one more tool, or one more arrow in their quiver that they could offer up to their airline customers," he adds.

The insurance market has been involved in the aviation market for a long time, but on the asset side of the balance sheet as premiums received on insurance policies have been used for investments in enhanced equipment trust certificates, ABS, and unsecured bond issuances of airlines and leasing companies.

"The part of the insurance companies we deal with is the liability side. That is where the underwriters and actuaries work and they are the ones who build the risk and pricing models. When [insurance broker] Marsh and Boeing started to talk to the insurers about becoming a significant player in aircraft financing, some immediately saw the potential," says Morin.

"The AFIC Non-Payment Insurance (ANPI) is a very robust form of non-payment insurance. There are very few conditions or exclusions in the ANPI policy. If an airline does not pay the scheduled payment of principal and interest on the scheduled payment date, the lending bank or investor has the right to submit a claim under the insurance policy. The AFIC insurers are required to pay very shortly thereafter."

In a typical transaction, AFIC and its insurers usually take the primary role in terms of originating, underwriting, structuring, negotiating, documenting, and closing the aircraft financing, with the insurers' attorneys controlling the documentation.

Morin explains: "Traditional non-payment insurance has been used in connection with an aircraft financing, but those transactions are bank-driven as it is the bank that originates, structures, underwrites, negotiates and documents the deal with an airline."

He adds: "In traditional non-payment insurance, the insurance markets get involved after the

deal is set – the bank would approach an insurance broker and ask them to try to lay off some of that risk with insurers who would provide a traditional non-payment insurance policy. But in all those cases, the insurers always require the bank to retain a portion of the risk, because it was the bank who knows the airline best and who originated, underwrote, negotiated and documented the financing. The insurance industry takes great comfort that the bank that structured and documented the deal still has skin in the game and therefore structured and documented the deal correctly."

And this is the fundamental change as to what AFIC has done.

"We have turned the non-payment insurance paradigm on its head," says Morin.

There are two groups within AFIC: the Advisory & Operations group, based in Washington DC, which sees its clients as the AFIC insurers. The other part of AFIC is the Credit Specialties team, based in London, led by Leslie Kurshan, which plays the more traditional role of Marsh as insurance broker to the financial institutions funding the AFIC supported aircraft financings.

"AFIC Credit Specialties see their clients as the financial institutions who are funding the deal, who are getting the benefit of the ANPI policy written by the AFIC insurers," explains Morin.

AFIC insurers, take all the credit risk, aircraft value risk, and the legal, repossession and jurisdictional risk in the aircraft financing transaction.

Morin is quick to point out that, even in the current environment, AFIC has not been in the situation of having to repossess aircraft. "On an absolute and relative basis, the AFIC portfolio is performing better than most," he says.

This has provided the AFIC insurers, some of which were not that familiar with aircraft financing prior to becoming involved with AFIC, some comfort about the industry.

Morin says AFIC, since its inception, has closed transactions with 13 airlines and leasing companies and two buyers of Gulfstream business jets.

In its three-and-a-half-years of existence, AFIC has closed on 68 transactions for more than $5 billion in financings.

The insurance-supported financing product closed 16 aircraft transactions in the final six months of 2017. The following year a total of 28 aircraft deals closed while, in 2019, 14 transactions closed.

Morin says 2020 started strongly but ended the year with just 10 transactions.

"We closed on the financing of five widebody aircraft in the first quarter," he says, and with Boeing delivering a total of only 70 commercial aircraft to customers in the first half of 2020, the AFIC share accounted for almost 9% of all Boeing deliveries.

> *"We have seen in the immediate aftermath of Covid-19 some banks hitting the pause button as they were concentrating on managing their existing aircraft portfolio."*
>
> **Robert Morin**, managing director, AFIC

He is optimistic for 2021 as AFIC positions itself for the return of the Max.

AFIC has been a large supporter in financing Max aircraft. Before the Max's grounding in March 2019, AFIC had supported 31 Max deliveries out of a total of 384 delivered Max aircraft, making AFIC one of the largest financiers of Max aircraft.

"At the time of the grounding, AFIC was mandated on 12 more Max aircraft. Those transactions have now expired and we will need to rebid on those deals," he reveals.

"We have put out some offers for previously delivered Max aircraft, but we are also talking to airlines and leasing companies about new Max deliveries, either from the Boeing stored fleet of Max aircraft or from the Max aircraft currently being built."

Debt market

What has changed over the past two years is the airline industry and the bank market and Morin recognises the different environment.

"It has gone 180 degrees. In 2018 and 2019, some airlines were doing very well and they were focused on de-leveraging and strengthening their balance sheets and were paying cash for some of their new aircraft deliveries," he says.

However, in the current Covid-19 environment, Morin sees an even more popular role for leasing companies, as airlines tap the sale and leaseback market and focus on liquidity.

"There is a group of lessors that are finding it a bit challenging to find the debt for sale and leasebacks and that is why a popular structure over the next 12 to 18 months will be supported finance of sale and leaseback transactions."

In the current environment, bringing a pure commercial airline risk to a bank's credit committee is challenging.

"If they bring a supported finance deal, it changes the conversation at the credit committee because you are looking at highly rated insurance companies supporting a deal with an insurance policy that is close to a guarantee."

Over the past year, some of the smaller aviation banks have paused on new transactions.

"We have seen in the immediate aftermath of Covid-19 some banks hitting the pause button as they were concentrating on managing their existing aircraft portfolio and could not devote the resources needed for new transactions. But even other banks were going slow on increasing their exposure until they really knew the depth, scope and duration of the aviation downturn," says Morin.

He also observes that since November, some banks have once again expressed their willingness to do new transactions.

"Almost every bank will find it easier to go to their credit committee with a supported transaction, and some banks would rather do an AFIC supported deal over an Ex-Im Bank or other ECA supported deal because the risk return trade-off is better. Some banks think that Ex-Im Bank and ECA margin levels are too skinny when factoring in the cost of funding."

"With AFIC, they can generally get higher margins because the AFIC premium will usually be less than the Ex-Im Bank exposure fee would be. So, on balance, AFIC can still be very competitive," he says.

Opening pool of insurers

The grounding of the Max has had a profound effect on the industry.

"Because we are focused on Boeing aircraft, we were very affected by the grounding of the Max. We have spent a lot of time following the developments on the technical side regarding the return to service of the Max, but also with respect to the changes to the Max orderbook and who is stepping up and financing and leasing Max aircraft. We consider ourselves to be highly knowledgeable of the currently available financing options regarding the Max," says Morin.

The AFIC Max exposure to date has been in Europe, the Middle East and Africa (EMEA). The firm has two customers in Asia but all of that exposure is with respect to widebody aircraft.

"EMEA has been our sweet-spot and we have done repeat transactions in those regions. Every year we would like to add a few new customers but we also value repeat business, and we want to do more for our existing customers. We think repeat business is the best endorsement of the AFIC product," he adds.

Morin says that about half of its customers have done repeat business on Boeing deliveries through the AFIC structure.

"We also have repeat business from the financial institutions that are funding our

deals, which is also a vote of confidence in the product," he says.

The success of the Marsh/Boeing-sponsored AFIC may lead to its expansion beyond the existing panel of four insurance companies, and Morin confirms that discussions are on-going.

"Discussions with new potential insurance companies are more challenging at the moment because of the Covid-19 crisis. But other insurance companies have taken note of the fact that we have supported over $5 billion of aircraft transactions in three-and-half years and that those financings have generated a significant amount of premium for the AFIC insurers."

Morin says expanding the pool of insurers will give AFIC more flexibility.

"Right now, we generally act by consensus. All the insurers have to agree to do a deal on the same terms. If we expand the pool of insurers and we have a sufficient number of insurers with the right credit rating that want to do the deal, we will no longer have to operate by unanimous consent. So long as we have sufficient capacity from appropriately rated insurers, we could move forward and this would potentially enable AFIC to support more transactions," he says.

The insurance companies came into this market based on their view that there was an acceptable risk and reward on aircraft financings, so long as AFIC selected the right airline and structured the financing appropriately. The situation has changed, as almost every airline in the world is a weaker credit today than it was a year ago. As a result, Morin admits the guidelines of the type of transaction that the AFIC insurers want to do has changed – "their strike zone or sweet spot has become smaller and tighter".

"AFIC was always a credit-based aircraft financing solution. Our business model is credit-driven and that is part of the value-proposition that AFIC Advisory & Operations brings to the table," he comments.

However, he adds: "We don't have delegated authority and, ultimately, the decision on which deal we do or not do, and the terms of the deal, lies with the AFIC insurers. We have a role in presenting the transaction and in helping the insurers understand the airline and the environment in which it is operating, but ultimately it is the insurers' decision to proceed or not."

But the Covid-19 pandemic has presented an opportunity to diversify the AFIC portfolio, not only by adding new airlines and leasing companies, but also with some stronger and higher quality credits.

Morin believes AFIC has a value proposition for a broader range of airlines today compared with the pre-Covid-19 period.

"We have extended our offering to Embraer aircraft and we recently closed the first AFIC-supported Embraer transaction."

Robert Morin, managing director, AFIC

"In the pre-Covid-19 era, where liquidity was in abundance and rates were low, we did not have a value proposition that appealed to all the airlines we are talking to today.

"In the current environment, we are engaging with those stronger airlines and leasing company credits as they at least want to hear what we can do. We recently closed our first AFIC supported financing for an airline in the Americas and our first airline in the USA," says Morin.

More innovations

AFIC transactions have largely centred on new deliveries.

"AFIC targets new or relatively new deliveries," he confirms, adding that assets considered to be in AFIC's deal zone are up to three years of age.

Beyond three years, other metrics such as maintenance conditions start to play a larger role, he observes.

"We have extended our offering to Embraer aircraft and we recently closed the first AFIC-supported Embraer transaction. We are willing to support the financing of new or almost new Embraer E1 and E2 aircraft," he says.

Morin says AFIC is hungry for, and has appetite for, supporting new transactions so long as they are properly structured, and sees 2021 as a year with more AFIC product developments and offerings.

Recently, the AFIC insurers announced they will look at leasing platforms on a limited recourse basis for the right opportunities.

"We will consider certain leasing companies on a limited recourse basis for the right opportunities. It is really important because it opens up another dozen platforms that are just not set up to do full recourse financings. It also opens up the JOL [Japanese operating lease] market for AFIC, and I would hope that, in 2021, you will see the first AFIC supported JOL transaction."

AFIC, which also has seen a fair number of institutional investors from Europe, is looking at attracting funding from other regions. "It will be great to crack the US private placement market, because it is such a broad and deep market," he comments.

Morin believes 2021 could be a good year for supported financings.

"Ex-Im Bank will do its share, as will UKEF [UK Export Finance] and the other export credit agencies, but I think it will be a particularly strong year for AFIC and the other supported finance platforms. I don't think people should look at the very limited number of Ex-Im Bank supported financings of Boeing aircraft during the last 18 months as an indication of what Ex-Im Bank will do in the future. Their pace is going to pick up and that is good for the industry," he says.

The fact that, in addition to AFIC, there are now three other private sector supported financing platforms is evidence of the quality and value of the solution.

"Imitation is the most sincere form of flattery," he says, adding: "Once AFIC demonstrated that a private sector supported aircraft financing solution was doable, it was almost inevitable that competitors would arise and come to the market. While each is designed slightly differently, we believe that AFIC remains the superior solution."

Flipping the non-payment insurance paradigm, where it is the AFIC Advisory and Operations team originating, structuring, documenting and closing the deal makes some of AFIC's funding institutions more comfortable.

"Some of our funding institutions are not big players in aviation, but they like the risk/return trade-off they get from funding an AFIC supported aircraft financing, where they have the benefit of a very robust ANPI policy written by highly rated, AA/A+ insurance companies," he says.

Morin adds that other banks see AFIC as a way for them to begin to get involved in aviation finance.

"Sometimes, there has been an institutional decision to get involved in aircraft finance," he says, "but they want to do it in a careful, prudent way. Doing it with AFIC is like riding a bicycle with training wheels, as it is hard for those banks to get hurt."

In with **the new**

With relentless shareholder support, Chinese lessor CDB Aviation is going full speed ahead acquiring modern-technology aircraft through sale and leaseback deals. The time for "silly deals" is over, the lessor's chief executive officer, Patrick Hannigan, tells **Dominic Lalk**.

The Covid-19 pandemic is undoubtedly the toughest predicament the aviation industry has ever faced, but that does not stop CDB Aviation from expanding its business. In fact, the lessor had a major growth spurt over the past 12 months because of the ways the crisis changed industry dynamics, its chief executive officer (CEO), Patrick Hannigan, tells *Airfinance Journal*.

"Of course, 2020 has been a difficult year but we're doing OK. Our job is spending a lot of time talking to our customers. We've spent a lot of time talking to people this year, negotiating and renegotiating deals with airlines, but we also renegotiated deliveries with the OEMs [original equipment manufacturers], either delays on the Airbus side or certification delays on the Boeing side," says Hannigan.

He admits that a lot of CDB Aviation's continuous success, particularly during these most challenging of times, is the result of strong shareholder support. The lessor is backed by CDB Leasing, which is a unit of the mighty China Development Bank.

"We've raised a lot of capital throughout the year. It's good to have a strong shareholder who is committed and who wants to be in this industry for a long time, willing to deploy capital throughout the cycle," says Hannigan.

"We raised $3.3 billion of debt in 2020 so we could continue to function and to grow our business. We did about 45 sale and leaseback [SLB] transactions for new technology aircraft, too. Our long-term strategy is to get more new-technology aircraft. We already have about 50 Neos in our fleet but we want to get there quicker because this is the place we want to be longer term and where our shareholder wants us to be, so that's our focus," he says.

"[CDB Aviation] chairman [Xuedong] Wang specifically said to me at the beginning of March when we went into this: spend more time with your customers, get to know them, get to find out what the issues are. Is it a deferral? Is it an OEM delivery time slot that needs to be moved or pushed back for some time? Is it a sale and leaseback? What does it take to get your airlines through to the other side? We can only all get back on track and build our business post-Covid if our airlines are doing OK. Their success is key to our success," says Hannigan.

He does, however, believe there will be a much stricter approach to credit going forward.

"I think a lot of people will have learnt through the current cycle that those airlines that were positioned well going into this will come out the other side of it. We need more credit discipline going forward," he says.

Chinese bank-backed lessors will weather the ongoing crisis better than some of their peers, say analysts, and, as a result, the credit profiles of these lessors are expected to remain stable.

The implicit and explicit support from parents has sustained Chinese lessors' liquidity access, easing near-term refinancing risks and funding requirements for committed capital expenditure.

In Covid 2020, CDB Aviation inked sale and leaseback agreements covering 23 Airbus A320neo-family and A350 programme units, as well as 21 Boeing 737 Max and two 787 aircraft, *Airfinance Journal* data shows. The firm agreed the Airbus sale and leaseback deals with Frontier Airlines, Wizz Air, SAS and TAP Portugal; it transacted Boeing aircraft SLBs with United Airlines and Westjet.

Could this expansion continue in 2021? Are CDB Aviation's growth ambitions limitless?

"Our parent wants us to be a key player in the aircraft-leasing industry. They don't want us to be the biggest. We have close to 150 OEM delivery slots coming at us over the next few years, plus sale and leaseback activity, so we are growing, but we are not in a rush. We did it in 2020 because it made sense to support our customers, while, at the same time, we got new-technology aircraft sooner than we otherwise would have," says Hannigan.

The seasoned leasing veteran, who took the top job in January 2020 after being promoted from president and chief commercial officer, observes that terms and conditions on lease deals have improved since he took office. His predecessor, Peter Chang, shortly before his retirement told *Airfinance Journal* that it was "shark-infested waters out there", with lessors undercutting each other for extremely thin yields.

"The terms and conditions of the leases have gotten a little bit better post-Covid. I think they were a bit crazy before Covid. A lot of people were chasing yields and silly deals that we backed out of so we didn't do a lot of SLBs in the last three years and focused more on the placement of our new on-order aircraft and the trading side," says Hannigan.

With improved sale and leaseback pricing, Hannigan says the time to make executive decisions had come.

"Every airline has to look at the situation currently and say OK where can I source capital from, I need to build up buffers. Sourcing capital is tough. A lot of banks do not want to increase their exposure to the sector.

"SLB terms and conditions have certainly improved post-Covid but there's still a lot of competition. You will have seen many deals from other lessors, too, mainly lessors with shareholders who are in the business for the long term and have access to capital in the current environment. You don't have the market to yourself; it's a competitive environment, but for the right names and right credits you do the deals."

In the six months to 30 June, CDB Aviation signed lease transactions for 15 aircraft with seven customers. It acquired 11 aircraft and sold 13 during the first half.

As of 30 June, CDB Aviation owned and managed a portfolio of 228 delivered aircraft assets on lease to 67 lessees in 36 jurisdictions. These were valued at RMB95.8 billion ($14 billion), representing a 2% increase compared with 31 December 2019. Its total revenue and other aircraft leasing segment income amounted to RMB4.57 billion, representing a year-on-year increase of 8.6%.

Since its founding in 2006, CDB Aviation's core business has naturally focused on China.

"Fifty-six per cent of our revenues come from China and 25% of our OEM slots go to China alone," says Hannigan. Europe is its next largest market, followed by South Asia, Latin America and the CIS.

Chinese-based airlines make up seven of CDB Aviation's top 10 customers. Hannigan says China is and will remain a "very important" part of the business, noting that "ultimately our DNA is Chinese".

Boeing 737 Max

The almost 21-month-long grounding of the 737 Max programme has created an abundance of complexities and issues for airlines and lessors worldwide but the worst seems over, after recertification by the US authorities late last year. Because of it, CDB Aviation does not plan on cancelling any additional 737 Max orders, Hannigan exclusively tells *Airfinance Journal*.

CDB Aviation's orderbook stood at 101 Max firm orders going into the crisis, with deliveries due through 2025. In 2020, the lessor reduced its commitment to "about 70 aircraft", after cancelling contracts for 29 undelivered aircraft originally due for delivery from 2020 to 2024. Separately, CDB Aviation deferred the deliveries of 20 of the 70 remaining orders "into the horizon", to unscheduled dates through 2026.

Hannigan agrees that there is great concern about 737 Max lease rates over the next 24 months but that he need not worry about this because the lessor made "all the right decisions very early on".

> *"When things settle down we can have a meaningful conversation with airlines about lease rates that make sense for us as an investor and them as an airline."*
>
> **Patrick Hannigan**, chief executive officer, CDB Aviation

With no Max delivery commitments until 2024, Hannigan says: "Max lease rates over the next 24 months, that's a great question. It's the exact question I asked when I took office in January."

"Even before Covid we were looking at that question. Covid-19 accentuated it, there's no doubt about that, but we started looking at this months and months ahead. The [Max] announcement we did in April, that was months in the making. Why did we do it? For the reasons you've ultimately outlined: there was too many aircraft on offer and airlines were getting ridiculously low lease rates for really good modern-technology aircraft that were costing us quite a lot of money.

"So we had already discussed the Max pre-Covid and the result of that exercise was the cancellation, which worked for both Boeing and for us because they don't require us to take delivery of aircraft we couldn't put on lease," says Hannigan.

"So, to answer your question: I don't need to worry about that for another 24 months, so I don't have the answer to that," he laughs.

"I only can control what I can control and that's all I focus on. I did my work with the manufacturers early on, and that includes Airbus, to make sure that I don't have a problem for another 24 months and then we'll address low lease rates once we come out the other side of the current cycle," he says.

Ever ready to respond to evolving customer requirements, Hannigan says the Chinese bank-backed lessor "of course" remains open to bringing the 737 Max back sooner but for now CDB Aviation is happy with the deal it has got.

"If our customers say that they want the aircraft sooner, then sure, we can have a discussion about that," says Hannigan. "But for the moment, we've pushed our problem out and we hope things will settle down first. After that, we can have a proper meaningful conversation with airlines about lease rates that make sense for us as an investor and them as an airline."

A320neo ready for renewed competition

Geoff Hearn gets views on how the market for the successful new Airbus narrowbody will be impacted by Covid-19.

The first A320neo entered service in 2016

The new-engine-option (Neo) version of the A320 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.

The respective engine manufacturers claim that their engines offer a fuel saving of about 15% compared with their equivalent predecessors. The drop in fuel prices resulting from the Covid-19 crisis has reduced the corresponding operating cost advantages of the A320neo over previous-generation aircraft.

Airbus says the A320neo has 95% airframe commonality with the original A320 models and says this commonality is a key factor for customers and operators. The first A320neo entered service in 2016.

In common with many modern aircraft programmes, the initial service experience of the new model has been troubled, not least because of issues with the Pratt & Whitney engine.

However, the troubles of the A320neo are minor compared with the difficulties that its competitor, the Boeing 737 Max 8, has undergone after two fatal accidents early in its service life. As a result of the accidents, the Max 8 was grounded in March 2019 and was cleared by the US federal aviation authorities to return to service only in November 2020. The extended grounding has resulted in a loss of sales of the Boeing aircraft and an increase in market share for the A320neo, albeit in a market suppressed by the Covid-19 pandemic.

The return to service of the Max family will undoubtedly increase its competitiveness, but how much reputational damage has been done remains to be seen. The 737 Max 8 is a genuine rival to the A320neo as witnessed by its market penetration achieved prior to the accidents.

Previous analyses by *Airfinance Journal* indicate that, in terms of operating cost, the aircraft are very closely matched. The findings suggest the Max 8 costs about 3% more to operate for each trip than the A320neo, which equates to a seat-cost advantage of about 5% for the Boeing model. This is, of course, highly dependent on what seating is assigned to each aircraft, and the difference in capacity is a matter of debate between the manufacturers.

Key data A320neo versus 737 Max 8

Model	A320neo	737 Max 8
Maximum seats	194	200
Typical seats	150-180	162-172
Range (nm/km)	3,400/6,300	3,515/6,510
Entry into service	2016	2017
Total orders	3,919	3,467

Source: Airfinance Journal Fleet Tracker and manufacturer data

ISTAT APPRAISERS' VIEWS

Collateral Verifications

Gueric Dechavanne, vice-president, commercial aviation services

The market demand for the A320neo has remained strong since the aircraft's launch in 2010. This demand has kept values and lease rates stable in the past 12 months. Collateral Verifications (CV) is not aware of any aircraft listed as available for sale and/or lease, with all of the aircraft in storage being there as a result of the Covid-19 crisis.

The number of aircraft stored has come down by about 50% since June, which is a great sign that aircraft are being put back to work. As traffic starts to recover, we fully expect that all of the stored aircraft will return to service.

Current market values have been under pressure because of the Covid-19 crisis, with values dropping by between 3% and 8%, depending on the vintage. The decrease in the production rate by Airbus will help to prevent oversupply in the market in the near term, which will in turn provide some stability to values and lease rates. The one concern is Airbus's announcement that it may increase production again during the second half of 2021. This could negatively affect the values of the existing fleet of A320s because it may be viewed as premature, based on the state of the recovery.

The next six to 12 months will certainly remain challenging for all aircraft as the industry starts its slow recovery out of the current crisis. Over the long term, however, CV believes these issues will be resolved, and the aircraft will continue to have a strong future as the replacement for the existing fleet of A320 aircraft.

The A320neo has been leasing for about $305,000 to $320,000 a month for new aircraft, which is about a $40,000 premium over the previous generation. With low fuel prices here to stay for the foreseeable future, making used aircraft very attractive, there is a lot of competition for lessors to place new aircraft – putting continued pressure on lease rates. As fuel prices rise and airlines shift their focus to new-generation aircraft, such as the A320neo, we expect lease rates to remain stable and increase overtime.

CV believes that the A320neo, with its quiet wide cabin, strong customer appeal, containerised cargo, competitive engine choices, fly-by-wire technology, plus commonality with other family members and Airbus models, will keep this aircraft in strong demand.

Oriel

Olga Razzhivina, senior ISTAT appraiser

On paper, the A320neo is the middle of the three fuselage sizes in the Neo family; however, the smallest A319neo has few orders and is likely to have a negligible commercial fleet. This poses a question as to whether the A320neo will follow the same path, as the focus of airlines shifts to the larger A321neo. In our view, it is unlikely.

First, the A320neo has a formidable orderbook of nearly 4,000 aircraft, which is more than double of the relatively popular original A319. Second, unlike its predecessor, which was arguably disadvantaged compared with the 737-800 by having six fewer seats, the A320neo can accommodate up to 194 seats with the Airbus CabinFlex interior. Third, the size creep that has been happening in the single-aisle sector is likely to be paused by the Covid-19 crisis, with airlines retrenching to smaller aircraft in an attempt to reduce cash burn. This trend may even result in some A321neo orders being converted to the A320neo variant.

Undoubtedly, the A321 was the more popular model by the time Neo models had entered production, with the larger model having double the orders of its predecessor. The preference for the A321 variant will continue long term. The A321neo's role may extend to medium-range operations, thus leaving the traditional short-haul space to the A320neo.

Like its predecessor, the A320neo is popular with both airlines and lessors, which aids its proliferation across all airline operating models. Although participation by a large number of lessors can intensify competition and lower lease rates, lessors have been successful in cancelling or deferring their orders during the Covid-19 crisis, limiting the negative impact.

Nonetheless, A320neo values and lease rates are not immune to the devastating effect of the disruption caused by the pandemic. However, being the new-generation in-production type, Neo values will recover, ahead of the older-generation Airbus and Boeing models. Furthermore, Airbus's temporary production rate cuts have moderated the influx of new aircraft and will support values and lease rates during the recovery.

The prolonged Max grounding in conjunction with the Covid-19 crisis has created a new dynamic in single-aisle competition. While previously, with production sold out for years, it was nearly impossible for an airline to switch a substantial order between manufacturers, there are now dozens of 737 Max aircraft, which could be available at short notice at competitive pricing. Whether these will attract any airlines which have ordered Neos remains to be seen. Operators of previous-generation 737s are more likely to be persuaded.

In the long term, we expect the A320neo values and lease rates to recover because the type will be one of the "work horses" of the industry for decades. We expect the value dynamics of the two engine choices to mimic that of its predecessor.

Even though today's orderbook favours the CFM Leap engine, there are still more than 1,000 orders with the engine selection pending. As both engine manufacturers address teething issues, we expect a relative parity of market share.

A cockpit upgrade driven by the incorporation of the technology from the A220 family could be a positive continuous improvement for the Neo in the medium term.

While the development of an all-new Boeing single-aisle is possible, it is more likely to be larger than the A320neo, limiting the competitive pressure.

A320neo current market value ($m)

Build year	2017	2018	2019	New
CV view	37.00	37.92	39.22.	49.88
Oriel view*	32.50	34.50	41.65	49.30

**Maintenance status assumes half-life, except for new aircraft, which assumes full life, and one-year-old aircraft, which assumes 75% life.*

A320neo indicative lease rates ($'000s/month)

Build year	2017	2018	2019	New
CV view	290	300	310	320
Oriel view	265	275	290	315

Airbus goes small

The larger members of Embraer's E2 family face stiff competition from the Airbus A220 models in a market that will take time to recover from Covid-19. **Geoff Hearn** looks at which aircraft are best placed to profit from an eventual recovery in the small single-aisle segment.

Even before the Covid-19 crisis, the 20-year projected demand for new products in the 100 to 150-seat to 150-seat market was relatively small, with the segment predicted to account for only 15% to 20% of the narrowbody market through 2039.

What the equivalent proportion will be after the impact of the pandemic is a matter of conjecture, but there is in any case an industry consensus that there will be an overall reduction in single-aisle deliveries of at least 25%.

Brazilian manufacturer Embraer, one of the main stakeholders in the sector, published a revised forecast at the end of 2020 in which it downgraded its previous projections for deliveries. The company now expects world passenger traffic to have a compound growth rate of 2.6% a year over the next decade.

This significant deceleration mirrors the gross domestic product (GDP) decline and the extended recovery period from the Covid-19 crisis. The scale of the damage is indicated by Embraer's prediction that global revenue passenger kilometres (RPKs) will not return to 2019 levels until 2024.

In a foreword to the report, Arjan Meijer, president and chief executive officer, Embraer Commercial Aviation, strikes an upbeat note. In his remarks he says: "Despite all of the challenges and volatility today, we believe the up to 150-seat aircraft segment will lead us to better times."

In this context, Embraer now foresees world demand for 5,500 new aircraft with up to 150 seats over the next 10 years, representing a total market value of $350 billion. The company believes the replacement of ageing aircraft will account for more than 75% of all new deliveries while 25% will be used to grow markets.


Embraer E2


Airbus A220

The manufacturer's forecast is broadly in line with other industry views, although it is difficult to make exact comparisons as definitions of size category tend to vary.

Consultancy firm MBA, for example, estimates there are about 3,800 aircraft in this market segment that will need to be replaced over the next decade. MBA believes that, because of the pandemic, many airlines are likely to hold onto their current fleet or simply retire aircraft and not replace them in the near term, which will delay order opportunities.

The reduced demand looks set to be fought over by two main competitors, but the rivalry has moved on from the battle between Embraer and Bombardier, which had been a feature of this market segment for many years. Airbus's takeover of the Bombardier CSeries programme and the rebranding as the A220 has resulted in a formidable opponent for Embraer.

It had looked as though Boeing would extend its rivalry with Airbus by entering a joint venture centred on the Brazilian manufacturer's E-Jets, but the demise of this project has left Embraer relying on its own resources.

The abandoning of the joint venture also means Boeing is left without a suitable product to compete in the market segment, given the 737 Max 7 is significantly larger and heavier than the A220 and new E-Jet models. The same is true of the A319 and, like the Max 7, is only a competitor in this segment if an airline is looking for fleet commonality with larger models in the respective family.

Lindsey Webster, vice-president asset valuations, MBA, believes that neither the A319 nor the Max 7 will be major threats in the sector. She says: "Essentially, both

Key data of competing Embraer E2 and Airbus A220 models

Model	E190-E2	E195-E2	A220-100	A220-300
MTOW (tonnes)	56.4	61.5	63.1	69.9
Typical seats single-class	106	132	100-120	120-150
Typical range (nm)	2,850	2,600	3,500	3,400
Entry into service	2018	2019	2016	2016
Delivered (including stored)	19	13	52	94
Orders backlog	16	130	57	441

Source: *Airfinance Journal* Air Investor 2021.

aircraft lost their place in the market as more efficient, right-sized aircraft became available."

The competition in the 100- to 150-seat category therefore comes down to a straight fight between the second-generation (E2) versions of the E190/E195 and the A220-100/-300 models.

Orders

There is little doubt that the acquisition by Airbus of the Bombardier-developed aircraft provided an impetus to their sales. Before the acquisition, the CSeries and the second-generation E-Jets had similar orderbooks, but the A220 models have since garnered far more sales than their competitors.

The A220 backlog is more than triple that of the E2 models. The only area where Embraer can claim an advantage is in a direct comparison between the A220-100 and the E195-E2.

Market characteristics

Webster suggests there are essentially two markets available to these aircraft. The first is short- to medium-haul thin routes, which until recently have been served by larger single-aisle aircraft. The second market is traditional regional routes.

Webster says: "Given the slow recovery for the international market, the short- to medium-haul routes may benefit from the size of the A220. However, the main market these assets will be flying is in the regional space."

She believes environmental issues could prove problematic in Europe.

"One of the obstacles facing the types is how airlines approach environmental, social and governance (ESG) initiatives. Although the E2 and A220 models have relatively low fuel burn and emissions, passengers are being encouraged to travel by train for journeys of less than three hours – the segment these aircraft would typically fly.

While the pandemic has taken over the headlines, muting some of these concerns to the general public, there is still uncertainty how regional routes in Europe will transpire as ESG becomes more pressing.

In North America, many regional routes are served by aircraft conforming to pilot scope clauses, which neither the A220 nor E2 models meet, although the A220 has made some inroads in the sector.

Webster believes another prospect for the A220 is the low-cost carrier sector, which has helped propel orders for Boeing and Airbus over the past decade.

She suggests there are some encouraging signs for Embraer and Airbus in terms of fleet activity.

"Looking at the current in-service fleet (albeit there are only a couple of dozen E2s in service), the A220s and E2 aircraft have some of the highest percentages of aircraft remaining active – with the A220-100s and E190-E2s having 100% active fleets. The A220-300, at 96% active, surpasses even Airbus's A320neo family," she says.

Webster does not anticipate an increase in aircraft availability.

"Although the aircraft may face challenges with securing significant orders in the near term, the size and economics of the aircraft make them desirable to operators as passenger demand slowly recovers. A prolonged [delay in the] return of passenger traffic could see either family entering the secondary market as a result of airline bankruptcy/restructuring.

"However, at this time MBA would not expect aircraft to become available should freedom of movement due to a successful vaccine distribution occur in 2021," she adds.

Indicative relative cash operating costs at pre-Covid fuel price

($1.9 per USG)

	E190-E2	E195-E2	A220-100	A220-300
Relative trip cost	95%	Base	102%	106%
Relative seat cost	121%	Base	112%	97%

Indicative relative cash operating costs at December 2020 fuel price ($1.1 per USG)

	E190-E2	E195-E2	A220-100	A220-300
Relative trip cost	95%	Base	103%	107%
Relative seat cost	121%	Base	113%	98%

Assumptions: 500 nautical-mile sector; fuel consumption, speed, maintenance costs and typical seating layouts are as per Air Investor 2021

Operating cost

Airfinance Journal has looked at the relative operating costs of the A220 and the larger E2 models. The most direct competitors from the respective families are the A220-100 and the E190-E2, but they are not exactly aligned in terms of seating. The stretching of the E2 version of the E195 compared with its predecessor means its seating capacity is between that of the A220-100 and -300 models.

Assuming a pre-Covid fuel price of $1.9 per US gallon, the *Airfinance Journal* analysis indicates the costs of the respective models are broadly in line with their respective seating capacities.

Taking the E195-E2 as the base the smaller Embraer model is about 5% cheaper to operate on a 500-nautical mile trip. The A220-100 costs about 2% more and the larger A220 model is about 6% more expensive. Using a fuel price more representative of the current situation ($1.1 per US gallon) makes the A220 models marginally less competitive, but the change is barely perceptible. The lower fuel price does, of course, negatively impact the advantages of all the new-generation models compared with the aircraft they are intended to replace.

In terms of cost per seat, the A220-300 appears the most competitive, which would be expected of the largest aircraft in the category, while the smaller E190-E2 has higher per seat cost than its stablemate and the Airbus competitors.

There are a number of caveats to the analysis. The Airbus models have higher maximum take-off weights, in part as a result of offering significantly more range than the competing Embraer aircraft. Should an airline not require the additional capability, it is possible to select lower maximum take-off weight options, which will reduce operating costs, particularly in a European environment. In some cases, the additional range may be a critical factor in an airline's selection process.

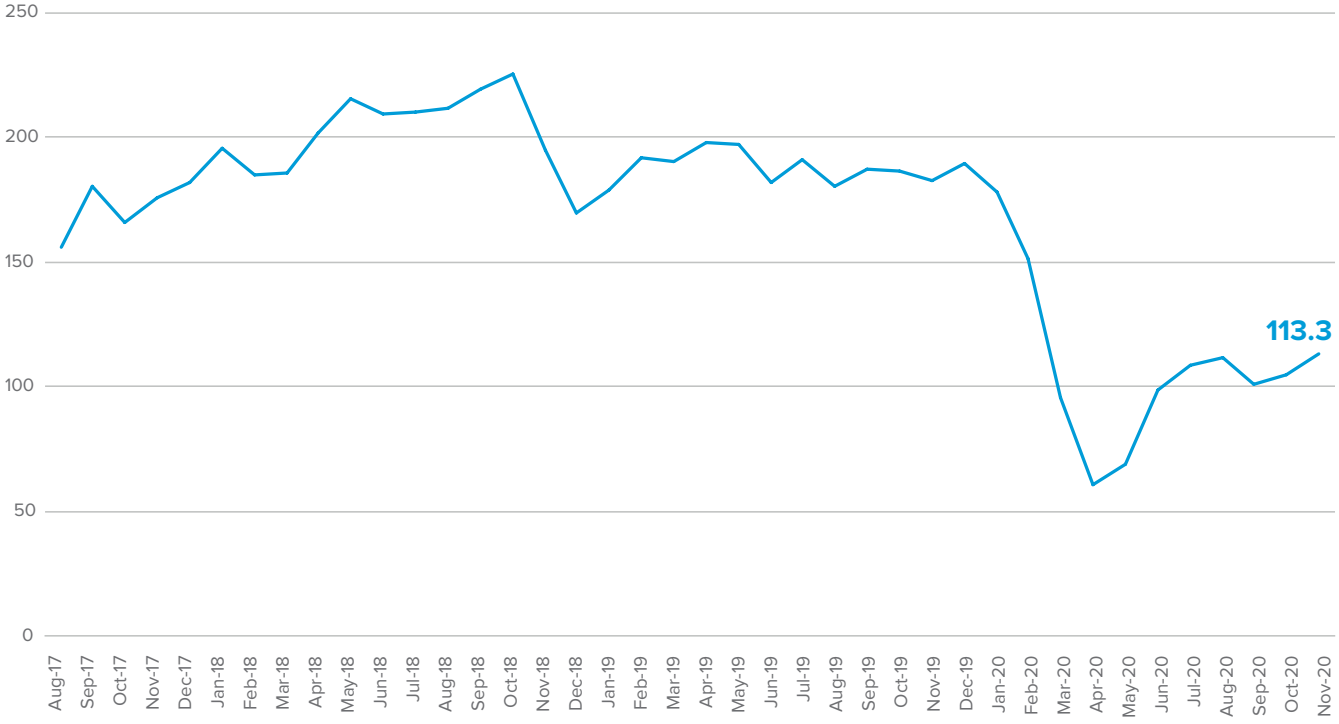
No room for newcomers

Potential new entrants have often targeted the 100- to 150-seat market – the E-Jet family and the A220 (as the CSeries) are examples of this trend. However, in the current climate, it looks unlikely they will be challenged by newer models.

Webster's view is forthright. "Given the major players in the space, it would be incredibly tough competition for anyone or any aircraft which tried to enter," she says, adding: "Although Embraer has floated the idea of a 90-seat turboprop, the distressed market for the De Havilland of Canada DHC8 400 and the previous soft market for the ATR72-600 [means] a new entrant at this time is unnecessary.

"Similarly, with the somewhat low orderbooks for the E2s and A220s and the minimal success of the smaller SSJ-100, there is likely diminished incentive to enter this segment."

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



Source: *US Energy Information Administration*

Commercial aircraft orders by manufacturer

	Gross orders 2020	Cancellations 2020	Net orders 2020	Net orders 2019
Airbus (31 December)	383	115	268	768
Boeing (31 December)	164	635	-471	54
Bombardier - Mitsubishi Heavy Industries	0	0	0	15
De Havilland of Canada	0	0	0	10
Embraer	20	0	20	55
ATR	5	0	5	43

Based on *Airfinance Journal* research and manufacturer announcements until 23/12/2020

Recent commercial aircraft orders (November-December 2020)

Customer	Country	Quantity/Type
Ryanair	Ireland	75 Max 8-200
Alaska Holdings	USA	23 Max 9
Air Greenland	Greenland	One A330-800

Based on *Airfinance Journal* research up to 31/12/2020

Rating agency unsecured ratings

Airlines

	Fitch	Moody's	S&P
Aeroflot	BB-(neg)	-	-
Air Canada	BB-(neg)	Ba3(neg)	B+(neg)
Air New Zealand	-	Baa2(stable)	-
Alaska Air Group	BB+(neg)	-	BB-(neg)
Allegiant Travel Company	-	Ba3(neg)	B(neg)
American Airlines Group	B-(watch neg)	B2(neg)	B-(neg)
Avianca Holdings	D	-	D(NM)
British Airways	BB(neg)	Ba2(neg)	BB(neg)
Delta Air Lines	BB+(neg)	Baa3(neg)	BB(neg)
Easyjet	-	Baa3(neg)	BBB-(neg)
Etihad Airways	A(stable)	-	-
Grupo Aeromexico	-	-	D(NM)
GOL	CCC+	B3(stable)	CCC+(developing)
Hawaiian Holdings	B-(watch neg)	B1(neg)	CCC+(neg)
International Consolidated Airlines Group	-	Ba2(neg)	BB(neg)
Jetblue	BB-(neg)	Ba2(neg)	B+(neg)
LATAM Airlines Group	WD	-	-
Lufthansa Group	-	Ba2(neg)	BB-(neg)
Qantas Airways	-	Baa2(neg)	-
Ryanair	BBB(neg)	-	BBB(neg)
SAS	-	B3(stable)	B-(stable)
Southwest Airlines	BBB+(neg)	Baa1(neg)	BBB(neg)
Spirit Airlines	BB-(neg)	B1(neg)	B(neg)
TAP Portugal (Transportes Aereos Portugueses, S.A.)	-	Caa2(neg)	B-(watch neg)
Turkish Airlines	-	B3(neg)	B(neg)
United Airlines Holdings	BB-(neg)	Ba2(neg)	B+(neg)
Virgin Australia	WD	-	-
Westjet	B(neg)	B3(neg)	B-(neg)
Wizz Air	BBB-(neg)	Baa3(neg)	-

Source: Ratings Agencies - 18/12/20

Lessors

	Fitch	Moody's	S&P	Kroll Bond Ratings
AerCap	BBB-(neg)	Baa3(neg)	BBB(neg)	-
Air Lease Corp	BBB(neg)	-	BBB(neg)	A-(neg)
Aircastle	BBB(stable)	Baa3(neg)	BBB-(stable)	-
Avation PLC	B(watch neg)	-	CCC(watch neg)	-
Aviation Capital Group	WD	Baa2(neg)	BBB-(neg)	A-(neg)
Avolon Holdings Limited	BBB-(neg)	Baa3(neg)	BBB-(neg)	BBB+(neg)
AWAS Aviation Capital Limited	-	Baa3(neg)	BB+(stable)	-
BOC Aviation	A-(stable)	-	A-(neg)	-
CCB Leasing (International) Corporation	-	-	A (stable)	-
CDB Aviation Lease & Finance	A+(stable)	A1(neg)	A(stable)	-
Dubai Aerospace Enterprise	BBB-(neg)	Baa3(neg)	BB+(stable)	BBB+(neg)
Fly Leasing	-	B1(neg)	BB-(neg)	BBB-(neg)
Global Aircraft Leasing	-	B1(neg)	-	-
ICBC Financial Leasing	A (stable)	A1 (stable)	A (stable)	-
ILFC (Part of AerCap)	BBB-(neg)	Baa3(neg)	-	-
Macquarie Group Limited	A- (neg)	A3 (stable)	BBB+ (stable)	-
Marubeni Corporation	-	Baa2 (stable)	BBB (stable)	-
Mitsubishi UFJ Lease	-	A3 (stable)	A- (stable)	-
Park Aerospace Holdings	BBB-(neg)	Baa3(neg)	-	-
SMBC Aviation Capital	A-(neg)	-	A-(neg)	-
Voyager Aviation	BB-(watch neg)	B3(neg)	CCC(neg)	BB-

Source: Ratings Agencies - 18/12/20

Manufacturers

	Fitch	Moody's	S&P
Airbus Group	BBB+(neg)	A2(neg)	A(neg)
Boeing	BBB-(neg)	Baa2(neg)	BBB-(neg)
Bombardier	CCC	Caa2(neg)	CCC+(neg)
Embraer	BB+(neg)	Ba2(neg)	BB+(neg)
Rolls-Royce plc	BB+(neg)	Ba3(neg)	BB-(watch neg)
Raytheon Technologies Corp	-	Baa1(stable)	A-(neg)

Source: Ratings Agencies - 18/12/20

US handling of economic crisis **versus European approach**

Different approaches to Covid-19 have led to different outcomes, but the spirit that swiftly delivered a number of vaccines could lead to a new era for aviation, writes **Adam Pilarski**, senior vice-president at Avitas.

We can assume with high confidence that eventually we will enter a period of recovery from the current economic and traffic meltdown because of the Covid-19 virus. As I mentioned in an earlier column, the biggest part of predicting the recovery patterns is out of our control because it depends on the character of the virus. There are, though, some reasonable predictions we can make to evaluate what will happen in the future.

Starting with traffic recovery patterns, most analysts are fairly uniform in their predictions. The belief about the patterns depends on the fact that close proximity of people contributes to the spread of the disease – hence, isolation is paramount.

So, predictions are that domestic traffic will recover ahead of international. VFR (air passengers visiting friends and relatives) will recover ahead of tourist traffic, with business traffic being the last one to come back. All this translates into shorter flights coming back to life ahead of longer ones and also ahead of connecting ones. This means that the demand for smaller aircraft (regional and single aisle) recovers ahead of larger widebodies more suited for longer flights. From these relationships we can also predict values of individual aircraft, airline profitability and so on.

Traffic is dependent on the state of the economy (ceteris paribus, or other things being equal). The other things include wars, terrorism or pandemic. Once the virus disappears, we will still have to deal with predicting the economy.

Most countries in the world experienced dramatic downturns in economic activity – in many cases by the largest percent falls in recent history. These declines, while very substantial, are dwarfed by declines in traffic, which for some periods were in stratospheric levels approaching 100%. Obviously, that was not the consequence of economic troubles but because of government edicts specifically forbidding travel.

When eventually we will overcome the virus and travel will again be allowed, and even encouraged, weak economies will then be a hindrance to the return of traffic. So, unfortunately we can still expect some negatives even after the virus is gone.

Our author at the *Airfinance Journal* Dublin 2020 conference.

> *We can assume with high confidence that eventually we will enter a period of recovery from the current economic and traffic meltdown.*

The unprecedented scale of the pandemic made predictions of economic activity quite different from standard times. First, the role of the government changed dramatically. On the one hand, governments restricted economic activity by forbidding people to have social contact by banning working and travelling. On the other hand, governments subsidised populations to spare them from the most draconian financial impact on their lives.

Interestingly, the USA and Europe had quite different approaches to handling the crisis and protecting their people. Europe tried to keep people employed, even if there was no longer demand for their products. Businesses were paid to keep employees furloughed while paying them, say, 70% of their salaries for being furloughed. As a result, unemployment rates in Europe were increasing continuously month after month reaching mid-8% levels and are expected to reach more than 9% next year.

In the USA, the unemployment rate was below 4% at the beginning of the year but skyrocketed to 14.7% in April to fall equally fast by October to below 7%. This was accomplished by basically gifting the population a generous stimulus to spur the economy in the very short term.

We still will have to deal with structural problems of the underlying non-Covid recession. And it will take a much longer time to reduce the unemployment rate to more acceptable levels.

Since the Covid virus is a major contributor to the existing economic disaster, the question remains how it will variously affect different regions. Social distancing will lead to less travel and less trade among nations. The USA will be less affected by such a development than Europe. This is because larger and more populous countries with the size of their domestic markets achieve more efficient production levels. Hence, the US has always been less dependent on trade than other developed economies.

A question is how the people will respond to government demands to restrict social contact and to take vaccines. A mistrust of government overall may slow down the fight against the virus. The fact is that the USA has the highest number of Covid fatalities in the world but it also faced the virus crisis during a most memorable and contentious election in recent history. This incentivised the government to support the population with generous monetary gifts at levels not previously ever imagined.

Globalisation, which some blame for the spread of the virus, also has some major positives. International competition to come up with a medical solution seems to have created a fairly substantial number of successful vaccines so far, with a number of additional ones around the corner.

It has taken the world a much shorter time to fight the spread of the virus compared with the polio pandemic of about 75 years ago. Hopefully, this spirit will prevail in other aspects of aviation such as reducing the carbon footprint of the industry and leading to a new golden era of aviation.

AIRFINANCE JOURNAL

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Air Investor 2021

Airbus A320neo family retains lead

Investors' appetite clearly remains in mainstream aircraft, especially in the widebody market.

Few investors venture outside the most popular types of the Boeing 787/Airbus A350 models. Of the top 10-favoured aircraft in 2020, seven were narrowbodies, two were widebodies and one aircraft was a turboprop (the ATR72-600).

Seven 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 environment in 2018 and 2019 favoured current-technology narrowbody aircraft as oil prices globally remained at reasonable levels, making a viable case for these types.

The Covid-19 pandemic is set to accelerate airlines' transitions to new-technology aircraft.

Airbus current-technology narrowbody productions are almost completed. By December 2020, Airbus's backlog for the A320 family included five A319s, 18 A320s and 29 A321s. But in the first 11 months of last year, the European manufacturer had delivered only 14 current-technology narrowbodies.

On the widebody side, Airbus delivered five new A330s and nine A330neos for the first 11 months of 2020.

The second market for the A330-200 and A330-300 models was difficult before the pandemic.

"The A330 entered the Covid-19 era against a landscape of oversupply and declining values and lease rates. There is therefore little surprise that the impact of the global pandemic on international traffic has further harmed its fortunes," says one pollster.

Placements are possible but lease rates are low. Owners are trying to hold onto the type. The market for the A330-300 has been particularly bad. Mid-life aircraft have been placed at between $210,000 and $250,000 a month.

The market was more than $250,000 to $280,000 a month by mid-2019 and above $300,000 two years ago, but the

Twin-aisles

Aircraft type	Residual value	Value for money	Operational success	Remarketing potential	Overall score	Last year's score	Difference
787-9	3.83	4.05	4.29	3.64	**3.95**	**3.84**	0.11
A350-900	3.74	3.90	4.10	3.50	**3.81**	**3.97**	-0.16
767-300ER	3.18	3.53	4.00	3.29	**3.50**	**3.91**	-0.41
787-10	3.18	3.68	3.75	3.00	**3.40**	**3.53**	-0.13
A350-1000	3.04	3.48	3.62	2.91	**3.26**	**3.17**	0.09
787-8	2.91	3.21	3.45	2.76	**3.08**	**3.16**	-0.08
777-300ER	2.38	3.14	4.18	2.26	**2.99**	**3.21**	-0.22
A330-900neo	3.00	3.29	2.85	2.82	**2.99**	**3.21**	-0.22
777-9	2.88	3.07	2.70	2.67	**2.83**	**3.33**	-0.50
A330-300	2.09	3.29	3.71	2.18	**2.82**	**3.17**	-0.35
A330-200	1.73	2.65	3.55	1.67	**2.40**	**2.7**	-0.30
A330-800neo	2.33	2.47	2.14	2.15	**2.27**	**2.51**	-0.24
777-8	2.38	2.57	2.10	2.00	**2.26**	**2.71**	-0.45
777-200ER	1.65	2.45	2.90	1.55	**2.14**	**2.52**	-0.38
747-8 pax	1.64	2.32	2.15	1.43	**1.89**	**1.9**	-0.01
777-200LR	1.59	2.21	2.25	1.38	**1.86**	**2.34**	-0.48
A380	1.00	1.90	1.90	0.95	**1.44**	**1.81**	-0.37

The Boeing 787-9 model topped the widebody category

bankruptcies at XL Airways and Thomas Cook Airlines did not help.

The lease rates of the A330-200 are more into the $200,000 range depending on age, condition and configuration.

Both A330s, along with the 777-300ER model, have expensive transition costs, and the cargo conversion market, although developing at a relatively slow pace, could absorb some of the fleet.

The first 777-300ERSF is expected to enter into service in 2022. The A350-900 and 787-9 are the strongest performers in the widebody market, but as one pollster writes: "Despite the positive acclaim, these aircraft will never achieve the investment ratings of the most popular narrowbodies."

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. The Boeing aircraft took the top spot for all four criteria: residual values, value for money, operational success and remarketing potential. Covid-19 has heavily impacted some airlines such as Norwegian, which has released some 787s back to lessors. The aircraft are being placed with other operators, despite a relatively difficult long-haul market.

The 787-9, along with the A350-1000 model, was the only aircraft in the widebody market to score better than the previous year. The 767-300ER maintained a relatively strong position in the ranking because of freighter demand, according to one trader.

Narrowbodies

The A320neo family benefitted from the woes at Boeing last year and was positioned, for a second year in a row, at the top of the narrowbody rankings.

The A321neo maintained its position at the top in the narrowbody aircraft market category scoring 4.54 overall (out of five), a small increase over the previous year.

The type continues to be the most popular aircraft at present. For the first 11 months of 2020, the A321neo variants received 145 net orders, representing half of Airbus overall net orders. Another 75 net orders were for the A320neo type, while 47 orders had been placed by Spirit Airlines for the A319neo.

At the end of November, Airbus had delivered about 429 A321neos to operators and had orders for 3,446 units. In comparison, 1,120 A320neos had been delivered and orders totalled 3,925.

Investors are comfortable with the A320neo family and again this is reflected in this year's poll.

The A220-300 recorded one of the best improvements of any single-aisle aircraft

Single-aisles

Aircraft type	Residual value	Value for money	Operational success	Remarketing potential	Overall score	Last year's score	Difference
A321neo	4.64	4.35	4.43	4.75	**4.54**	**4.45**	0.09
A320neo	4.44	4.26	4.39	4.46	**4.39**	**4.36**	0.03
737-800	3.72	4.14	4.70	4.21	**4.19**	**4.14**	0.05
A321	3.80	4.04	4.35	4.00	**4.05**	**4.01**	0.04
A220-300	3.80	3.89	4.00	3.84	**3.88**	**3.76**	0.12
A320	3.36	3.96	4.52	3.67	**3.88**	**4.08**	-0.20
737 Max 8	4.00	4.05	2.81	3.88	**3.69**	**3.73**	-0.04
737-900ER	2.84	3.32	3.48	2.79	**3.11**	**2.94**	0.17
737 Max 10	3.18	3.37	2.67	2.90	**3.03**	**3.37**	-0.34
737 Max 9	3.00	3.25	2.67	2.91	**2.96**	**3.1**	-0.14
737-700	2.27	3.00	3.30	2.38	**2.74**	**2.93**	-0.19
A319	2.12	2.91	3.35	2.17	**2.64**	**2.91**	-0.27
A319 neo	2.17	2.40	2.59	2.00	**2.29**	**2.27**	0.02
737 Max 7	2.32	2.63	1.77	1.94	**2.17**	**2.37**	-0.20

The A321neo led the way in three of the four criteria in *Airfinance Journal*'s investor poll: residual values, value for money and potential remarketing.

In particular, the model scored better in three criteria than in the previous year.

If the Boeing Max family had not been impacted too much until now, especially in the residual value and value for money criteria (because the consensus is the aircraft is a good investment), its remarketing potential has dropped dramatically over the past 12 months.

This may be a cause of concern because airlines and lessors have cancelled orders, and also because some customers may not want to take delivery yet as a result of the Covid-19 crisis in the airline industry.

The Max 8 is the least impacted of the four-aircraft family. Its overall score was only a few points below its 2019 total. The Ryanair order for the high-capacity Max 8-200 model in December 2020, along with the positive news on recertification in the final quarter, has provided more confidence in the type.

Airfinance Journal's Deal Tracker shows that lessors acquired 24 aircraft in the final quarter of 2020 under sale and leaseback transactions. In 2020, Avolon, BOC Aviation, CDB Aviation and DAE have been active in this sector.

Should the return of the Max family expand to the European and Asian skies in 2021, the aircraft type is expected to challenge the top narrowbodies in the next Air Investor's poll. In 2018, the Max 8 scored 4.21 points.

The market has not improved and remains limited for the Max 7 type, as well as the A319neo, which are now under pressure from the A220-300.

The A220-300 recorded one of the best improvements of any single-aisle aircraft, perhaps because the market is more accepting of the model.

Financing of the A220-300 has broadened over the past two years and airline request for proposals (RFP) are proving popular for the type.

A recent RFP saw 37 bids submitted, according to sources.

Air Baltic opened up the sale and leaseback market, and start-up Breeze Aviation is financing its future deliveries in the sale and leaseback market with GECAS, Einn Volant Aircraft Leasing, a joint venture between GECAS and Canadian pension fund manager Caisse de depot et placement du Quebec, and Voyager Aviation.

Lessors are placing aircraft. Recently, US lessor Air Lease signed its first operating lease commitment in Europe regarding its A220 orderbook. Deliveries are commencing mid-2022.

Interest has accelerated because the focus on domestic recovery is linked to growing interest in the A220 family, primarily the A220-300 model, says Air Lease.

In the meantime, Airbus has registered some cancellations for the A220 programme with leasing company Macquarie Airfinance taking seven aircraft out of its initial 40-aircraft order while Gulf Air cancelled a 10-aircraft order in November.

Air Canada has also cancelled 12 orders and is deferring 18 A220s due for delivery in 2021 and 2022.

The A321 remains the best performer of the Airbus current-technology product line, but there is an increasing distinction between models, with eight years of age, or 2012, models still benefitting from its success.

"Older models won't share the same success," says one pollster. However, the A321-200 has a bright future as a converted freighter.

The 737-800 retained its third position in the narrowbody ranking. The model benefitted from strong demand in 2019, albeit short- to medium-term lease requirements, as airlines needed uplift to cover the non-Max deliveries.

In 2020, demand for the type was lower, but more 737-800s headed for cargo conversion. But the consensus is that as the Max returns, the 737NG family, especially the 737-800, will experience a softening in values and lease rates.

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 maximum option available for the type in question. There may be lower-weight versions 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.

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 normalize 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 operational 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 data
The data is based on *Airfinance Journal*'s Fleet Tracker as of 15 December, 2020. The fleet information reflects the situation arising from the Covid-19 situation, in particular the high number of parked/stored aircraft. In acknowledgement of this situation, operator numbers and average age are based on the combined in-service and parked fleets.

Aircraft data index

Aircraft **data**

Airbus A220-100

SEATING/RANGE	
Max seating	133
Typical seating	100-120
Maximum range	3,500nm (6,350km)
TECHNICAL CHARACTERISTICS	
MTOW	63.1 tonnes (option 60.8)
OEW	35.2 tonnes
MZFW	52.2 tonnes
Fuel capacity	21,510 litres
Engines	PW1521G/1524G/1525G
Thrust	21,000lbs to 23,3000lbs
FUELS AND TIMES	
Block fuel 200nm	1,330kg
Block fuel 500nm	2,450kg
Block fuel 1,000nm	4,380kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET	
Entry into service	2016
In service	46
Operators (current and planned)	10
In storage	6
On order	57
Build peak year (2019)	24
Estimated production 2021	11
Average age (years)	1.8
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

SEATING/RANGE	
Max seating	160
Typical seating	120-150
Maximum range	3,400nm (6,300km)
TECHNICAL CHARACTERISTICS	
MTOW	69.9 tonnes
OEW	37.1 tonnes
MZFW	57.6 tonnes
Fuel capacity	21,510 litres
Engines	PW1521G/1524G/1525G
Thrust	21,000lbs to 23,3000lbs
FUELS AND TIMES	
Block fuel 200nm	1,370kg
Block fuel 500nm	2,510kg
Block fuel 1,000nm	4,490kg
Bock time 200nm	54 minutes
Block time 500nm	94 minutes
Block time 1,000nm	160 minutes
FLEET	
Entry into service	2016
In service	79
Operators (current and planned)	23
In storage	15
On order	441
Build peak year (2018)	30
Estimated production 2021	61
Average age (years)	1.7
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 A319neo

SEATING/RANGE	
Max seating	156
Typical seating	120-150
Typical range	3,400nm (6,300km)
TECHNICAL CHARACTERISTICS	
MTOW	75.5 tonnes
OEW	43 tonnes
MZFW	60.3 tonnes
Fuel capacity	26,730 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 (nominal)	2020
In service	none
Operators (current and planned)	5
In storage	none
On order	82
Built peak year	Not applicable
Estimated production 2020	Unknown
Average age (years)	Not applicable
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	2,550
Operators (current and planned)	321
In storage	1,730
On order	45
Built peak year (2013)	352
Estimated production 2020	10
Average age (years)	11.3
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	150-180
Typical range	3,400nm (6,300km)
TECHNICAL CHARACTERISTICS	
MTOW	79 tonnes
OEW	44.5 tonnes
MZFW	64.3 tonnes
Fuel capacity	26,730 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	923
Operators (current and planned)	121
In storage	194
On order	2,808
Built peak year (2019)	295
Estimated production 2021	200
Average age (years)	2.0
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

Airbus A321-200

SEATING/RANGE	
Max seating	220
Typical seating	185
Maximum range	3,200nm (5,950km)
TECHNICAL CHARACTERISTICS	
MTOW	93.5 tonnes
OEW	48 tonnes
MZFW	73.8 tonnes
Fuel capacity	30,030 litres
Engines	CFM56-5B/V2500-A5
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	1,001
Operators (current and planned)	119
In storage	647
On order	31
Built peak year (2013)	215
Estimated production 2020	10
Average age (years)	8.4
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	180-220
Maximum range	3,995nm (7,400km)
TECHNICAL CHARACTERISTICS	
MTOW	97 tonnes
OEW	50.1 tonnes
MZFW	75.6 tonnes
Fuel capacity	30,030 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	333
Operators (current and planned)	63
In storage	98
On order	2,957
Build peak year (2019)	127
Estimated production 2021	250
Average age (years)	1.5
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

Airbus A330-200

SEATING/RANGE	
Max seating	406
Typical seating	210-250
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	225
Operators (current and planned)	111
In storage	315
On order	11
Build peak year (2013)	51
Estimated production 2020	2
Average age (years)	11.4
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 A330-200 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 Trent 700/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)	11
In storage	0
On order	3
Build peak year (2012)	8
Estimated production 2021	2
Average age (years)	4.7
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	250-290
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	359
Operators (current and planned)	82
In storage	364
On order	12
Build peak year (2014)	74
Estimated production 2021	5
Average age (years)	9.9
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 A330-800neo

SEATING/RANGE	
Max seating	406
Typical seating	220-260
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	10,940kg
Block fuel 2,000nm	20,390kg
Block fuel 4,000nm	39,290kg
Bock time 1,000nm	184 minutes
Block time 2,000nm	299 minutes
Block time 4,000nm	529 minutes
FLEET	
Entry into service (planned)	2020
In service	2
Operators (current and planned)	3
In storage	none
On order	12
Built peak year	Not applicable
Estimated production 2021	1
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	260-300
Maximum range	7,200nm (13,330km)
TECHNICAL CHARACTERISTICS	
MTOW	251 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	31
Operators (current and planned)	25
In storage	21
On order	271
Build peak year (2019)	32
Estimated production 2021	15
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	$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	300-350
Maximum range	8,100nm (15,000km)
TECHNICAL CHARACTERISTICS	
MTOW	280 tonnes
OEW	116 tonnes
MZFW	195 tonnes
Fuel capacity	141,000 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	242
Operators (current and planned)	54
In storage	109
On order	422
Build peak year (2019)	80
Estimated production 2021	45
Average age (years)	2.7
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	350-410
Maximum range	8,700nm (16,100km)
TECHNICAL CHARACTERISTICS	
MTOW	316 tonnes
OEW	129 tonnes
MZFW	223 tonnes
Fuel capacity	159,000 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	39
Operators (current and planned)	15
In storage	13
On order	118
Build peak year (2019)	23
Estimated production 2021	25
Average age (years)	Less than 1
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	61
Operators (current and planned)	16
In storage	178
On order	8
Build peak year (2012)	30
Estimated production 2021	8
Average age (years)	6.4
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	720nm (1,330km)
TECHNICAL CHARACTERISTICS	
MTOW	18.6 tonnes
OEW	11.7 tonnes
MZFW	17 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
In service	41
Operators (current and planned)	23
In storage	12
On order	17
Build peak year (2019)	10
Estimated production 2020	5
Average age (years)	4.5
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	72
Maximum range	825nm (1,526km)
TECHNICAL CHARACTERISTICS	
MTOW	23 tonnes
OEW	14 tonnes
MZFW	21 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
In service	323
Operators (current and planned)	100
In storage	224
On order	160
Build peak year (2015)	79
Estimated production 2021	30
Average age (years)	5.0
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	3,580
Operators (current and planned)	240
In storage	1,299
On order	33
Build peak year (2016)	408
Estimated production 2021	10
Average age (years)	8.7
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 APU 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	2017
In service	28
Operators (current and planned)	94
In storage	327
On order	3,097
Build peak year (2018)	194
Estimated production 2021	Under review
Average age (years)	1.5
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 APU 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 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	2018
In service	1
Operators (current and planned)	15
In storage	27
On order	298
Build peak year (2018)	20
Estimated production 2021	Under review
Average age (years)	1.2
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 APU 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.

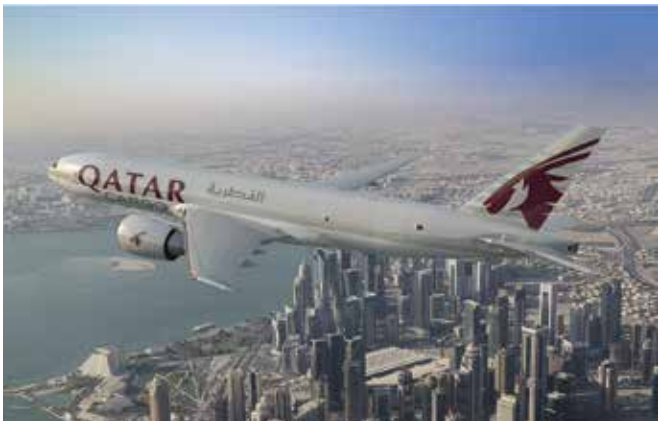
Boeing 747-8F

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	92
Operators (current and planned)	14
In storage	2
On order	12
Build peak year (2013)	20
Estimated production 2021	5
Average age (years)	6.3
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 767F

SEATING/RANGE	
Max Payload	52 tonnes
Maximum range	3,250nm (6,020km)
TECHNICAL CHARACTERISTICS	
MTOW	187 tonnes
OEW	81 tonnes
MZFW	133 tonnes
Fuel capacity	91,380 litres
Engines	GE CF6-80C
Thrust	63,300lbs (276kN)
FUELS AND TIMES	
Block fuel 1,000Nm	10,560kg
Block fuel 2,000nm	19,760kg
Block fuel 4,000 Nm	37,910kg
Bock time 1,000Nm	184 minutes
Block time 2,000Nm	301 minutes
Block time 4,000Nm	536 minutes
FLEET	
Entry into service	1995
In Service	185
Operators (current and planed)	17
In Storage	1
On order	48
Built peak year (2019)	18
Estimated production 2021	6
Average age	8.6 years
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$100-105 per flight hour
Higher checks reserve	$75-80 per flight hour
Engine overhaul	$165-170 per engine flight hour
Engine LLP	$255-260 per engine cycle
Landing gear refurbishment	$65-70 per cycle
Wheels brakes and tyres	$70-75 per cycle
APU	$105-110 per APU hour
Component overhaul	$250-260 per flight hour

Boeing 777F



SEATING/RANGE	
Max Payload	102 tonnes
Maximum range	4,970 nm (9,200km)
TECHNICAL CHARACTERISTICS	
MTOW	348 tonnes
OEW	144 tonnes
MZFW	248 tonnes
Fuel capacity	181,280 litres
Engines	GE 90-110/115
Thrust	110,000lbs (489 kN)
FUELS AND TIMES	
Block fuel 1,000Nm	14,140 kg
Block fuel 2,000nm	26,350 kg
Block fuel 4,000 Nm	50,780 kg
Bock time 1,000Nm	152 minutes
Block time 2,000Nm	277 minutes
Block time 4,000Nm	525 minutes
FLEET	
Entry into service	2009
In Service	196
Operators (current and planed)	25
In Storage	none
On order	38
Built peak year	25
Estimated production 2021	12
Average age	6.1 years
INDICATIVE MAINTENANCE RESERVES	
C-check reserve	$125-130 per flight hour
Higher checks reserve	$90-95 per flight hour
Engine overhaul	$290-295 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	$400-410 per flight hour

Boeing 777-300ER

SEATING/RANGE	
Max seating	550
Typical seating	365 (three-class)
Maximum range	7,370nm (13,650km)
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	604
Operators (current and planned)	52
In storage	215
On order	16
Build peak year (2016)	89
Estimated production 2021	12
Average age (years)	8.1
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	359
Typical seating	248
Maximum range	7,300nm to (13,530km)
TECHNICAL CHARACTERISTICS	
MTOW	227.9 tonnes
OEW	120 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	229
Operators (current and planned)	52
In storage	146
On order	50
Build peak year (2014)	104
Estimated production 2021	12
Average age (years)	6.1
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	296 (two-class)
Maximum range	7,530nm (13,950km)
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	395
Operators (current and planned)	69
In storage	162
On order	323
Build peak year (2018)	120
Estimated production 2020	36
Average age (years)	3.1
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	336
Maximum range	6,345nm (11,750km)
TECHNICAL CHARACTERISTICS	
MTOW	254 tonnes
OEW	135 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	2018
In service	50
Operators (current and planned)	14
In storage	11
On order	144
Build peak year (2019)	29
Estimated production 2022	24
Average age (years)	1.6
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 CRJ900

SEATING/RANGE	
Max seating	90
Typical seating	88
Maximum range	1,550nm (2,871km)
TECHNICAL CHARACTERISTICS	
MTOW	38.3 tonnes
OEW	21.8 tonnes
MZFW	32.1 tonnes
Fuel capacity	10,990 litres
Engines	CF34-8C5
Thrust	14,510lbs (64.5kN)
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	290
Operators (current and planned)	35
In storage	195
On order	18
Build peak year (2008)	59
Estimated production 2020	10
Average age (years)	9.6
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

De Havilland of Canada Dash 8 400

SEATING/RANGE	
Max seating	90
Typical seating	74
Maximum range	1,100nm (2,040km)
TECHNICAL CHARACTERISTICS	
MTOW	30.5 tonnes
OEW	17.8 tonnes
MZFW	29 tonnes
Fuel capacity	6,700 litres
Engines	PW150A
Thrust	5,070shp
FUELS AND TIMES (LR cruise)	
Block fuel 100nm	480kg
Block fuel 200nm	740kg
Block fuel 500nm	1,550kg
Bock time 100nm	44 minutes
Block time 200nm	65 minutes
Block time 500nm	126 minutes
FLEET	
Entry into service	1999
In service	328
Operators (current and planned)	75
In storage	236
On order	31
Build peak year (2010)	54
Estimated production 2021	12
Average age (years)	10.1
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 APU hour
Propeller	$15-20 per flight hour
Component overhaul	$145-150 per propeller hour

Embraer E190

SEATING/RANGE	
Max seating	114
Typical seating	98
Maximum range	2,400 Nm (4,450km)
TECHNICAL CHARACTERISTICS	
MTOW	47.8 tonnes
OEW	27.7 tonnes
MZFW	40.8
Estimated fuel capacity	16,210 litres
Engines	GE CF34-10E
Thrust	18,500 lbs
FUELS AND TIMES	
Block fuel 200nm	1,340 kg
Block fuel 500nm	2,710 kg
Block time 200nm	51 minutes
Bock time 500nm	89 minutes
FLEET	
Entry into service	2005
In service	331
Operators (current and planned)	87
In storage	229
On order	3
Build peak year (2008)	78
Estimated production 2021	3
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 per engine flight hour
Engine LLP	No data 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 E175

SEATING/RANGE	
Max seating	88
Typical seating	78
Maximum range	2,200nm (4,070km)
TECHNICAL CHARACTERISTICS	
MTOW	40.4 tonnes
OEW	22 tonnes
MZFW	32 tonnes
Fuel capacity	11,630 litres
Engines	CF34-8E
Thrust	13,800lbs (60kN)
FUELS AND TIMES	
Block fuel 200nm	1,180kg
Block fuel 500nm	2,390kg
Block time 200nm	51 minutes
Bock time 500nm	89 minutes
FLEET	
Entry into service	2005
In service	540
Operators (current and planned)	30
In storage	109
On order	178
Build peak year (2016)	88
Estimated production 2021	30
Average age (years)	6.2
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-E2

SEATING/RANGE	
Max seating	114
Typical seating	106
Maximum range	2,850nm (5,280km)
TECHNICAL CHARACTERISTICS	
MTOW	56.4 tonnes
OEW	33 tonnes
MZFW	46.7 tonnes
Fuel capacity	17,110 litres
Engines	PW1919
Thrust	19,000lbs (85kN)
FUELS AND TIMES	
Block fuel 200nm	1,140kg
Block fuel 500nm	2,300kg
Block time 200nm	51 minutes
Bock time 500nm	89 minutes
FLEET	
Entry into service	2018
In service	14
Operators (current and planned)	7
In storage	5
On order	16
Build peak year (2019)	7
Estimated production 2021	6
Average age (years)	1.5
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-E2

SEATING/RANGE	
Max seating	146
Typical seating	132
Typical range	2,600nm (4,800km)
TECHNICAL CHARACTERISTICS	
MTOW	61.5 tonnes
OEW	35.7 tonnes
MZFW	51.8 tonnes
Estimated fuel capacity	17,110 litres
Engines	Pratt & Whitney PW1919
Thrust	19,000lbs (85kN)
FUELS AND TIMES	
Block fuel 200nm	1,260kg
Block fuel 500nm	2,440kg
Bock time 200nm	51 minutes
Block time 500nm	89 minutes
FLEET	
Entry into service	2019
In service	11
Operators (current and planned)	11
In storage	2
On order	130
Built peak year	Not applicable
Estimated production 2019	20
Average age (years)	Less than 1
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	$180-185/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	106
Operators (current and planned)	31
In storage	62
On order	130
Build peak year (2018)	28
Estimated production 2020	12
Average age (years)	4.7
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	30.4	31.5	32.9	33.6	33.6	33.4	**32.6**
A220-300	35.3	35.8	36.4	37.1	38.0	38.2	**36.8**
A319neo	37.3	-	37.0	36.8	35.6	-	**36.7**
A320	42.6	42.0	39.9	41.7	42.2	40.5	**41.5**
A320neo	48.6	50.0	48.9	49.4	48.1	50.1	**49.2**
A321	47.9	47.5	46.4	50.4	50.4	48.3	**48.5**
A321neo	53.9	56.0	56.2	54.9	55.0	50.9	**54.5**
A330-200	78.6	70.0	70.5	78.0	64.7	-	**72.4**
A330-200 Freighter	82.7	98.5	70.6	91.2	77.2	-	**84.0**
A330-300	87.6	75.0	78.8	87.5	73.9	-	**80.6**
A330-800	89.5	-	98.4	95.6	96.0	81.4	**92.2**
A330 900 (neo)	100.0	105.4	109.5	101.9	109.6	97.4	**104.0**
A350-900	147.7	147.2	147.6	148.8	144.4	139	**145.8**
A350-1000	160.0	161.2	162.3	161.7	167.3	142	**159.1**
A380	195.2	147.4	177.6	194.7	132.4	-	**169.5**
ATR							
ATR42-600	15.7	-	15.3	15.7	15.6	15.3	**15.5**
ATR72-600	18.9	-	21.0	20.4	20.0	16.5	**19.3**
Boeing							
737-800	-	42.6	41.8	42.7	46.4	-	**43.4**
737 Max 8	46.5	47.1	46.7	47.8	48.1	45.4	**46.9**
737 Max 9	48.5	49.0	46.9	52.3	49.0	48.5	**49.0**
747-8F	180.2	187.7	164.6	182.6	190.6	182	**181.3**
767F	80.8	86.7	66.2	78.1	80.9	80.0	**78.8**
777-300ER	147.6	135.7	135.1	147.4	152.5	132.0	**141.7**
777F	166.1	170.4	143.4	156.9	168.6	149	**159.1**
787-8	114.5	112.4	112.2	117.9	119.5	108	**114.1**
787-9	138.1	140.0	139.8	141.2	141.8	138	**139.8**
787-10	150.0	147.0	143.5	152.1	152.6	147.0	**148.7**
Mitsubishi							
CRJ900	25.4	21.3	21.9	26.0	27.4	-	**24.4**
DeHaviland							
DHC8-400	20.0	-	21.2	20.3	19.9	16.8	**19.7**
Embraer							
E175	27.1	21.5	24.7	28.3	30.0	23.4	**25.8**
E190	31.0	-	-	-	21.9	-	**26.5**
E190-E2	32.4	29.0	30.2	32.4	31.9	30.6	**31.1**
E195-E2	34.3	31.7	34.3	36.5	34.5	32.3	**33.9**
Sukhoi							
SSJ100	24.0	-	20.4	22.5	-	-	**22.3**

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

Model	Avitas view	CV view	IBA view	ICF view	MBA view	Oriel view	Range
Airbus							
A220-100	220-230	230	209	223-247	237	230	**209-247**
A220-300	245-255	260	230	247-273	267	270	**230-273**
A319neo	265-275	-	239	262 -290	241	-	**239-290**
A320	300-310	280	238	277-306	286	275	**238-310**
A320neo	310-320	320	285	314-347	325	315	**285-347**
A321	330-340	310	260	335-370	341	280	**260-370**
A321neo	335-345	350	361	365-404	372	360	**335-404**
A330-200	570-600	450	570	548-606	394	-	**394-606**
A330-200 Freighter	685-715	750	632	624-689	535	-	**535-750**
A330-300	600-630	460	621	623-689	451	500	**451-689**
A330-800	650-680	-	683	636-703	585	660	**585-703**
A330 900 (neo)	685-715	725	762	726-803	668	740	**668-803**
A350-900	935-965	950	951	990-1,094	880	895	**880-1,094**
A350-1000	1,075-1,105	1,100	1,122	1,121-1,239	1,020	975	**975-1,239**
A380	1,405-1,435	1,200	1,345	1,295-1,431	807	-	**807-1,435**
ATR							
ATR42-600	125-135	-	136	104-115	117	130	**104-136**
ATR72-600	105-115	-	152	135-150	150	150	**105-152**
Boeing							
737-800	-	280	244	284-314	314	-	**244-314**
737 Max 8	270-280	320	262	282-311	325	295	**262-325**
737 Max 9	290-300	330	272	308-340	332	315	**272-340**
747-8F	1,455-1,485	1,275	1,330	1,214-1,342	1,306	1,425	**1,214-1,485**
767F	490-520	660	509	519-574	561	635	**490-660**
777-300ER	980-1,010	950	955	980-1,083	929	855	**855-1,083**
777F	1,085-1,115	1,200	1,152	1,043-1,153	1,207	1,085	**1,043-1,207**
787-8	760-790	725	723	784-867	729	705	**705-867**
787-9	885-915	900	863	939-1,038	864	810	**810-1,038**
787-10	915-945	950	924	1,011-1,118	930	910	**910-1,118**
Mitsubishi							
Mitsubishi CRJ900	165-175	165	171	173-191	205	-	**165-205**
DeHaviland							
DHC8-400	115-125	-	145	135-149	149	150	**115-150**
Embraer							
E175	200-210	215	178	188-208	225	180	**178-225**
E190	215-225	-	-	-	200	-	**200-215**
E190-E2	240-250	230	200	216-238	222	210	**200-250**
E195-E2	255-265	250	227	243-269	240	220	**220-269**
Sukhoi							
SSJ100	35-45	-	176	149-165	-	-	**35-176**

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