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Widebody Net Pricing Remains Subdued *“PAX VAX” Becomes Increasingly Likely As Delivery Rates Wither*

With orders for widebodies failing to advance and delivery rates being cut, Airbus and Boeing are having to contemplate significant discounting if production lines are to remain economically viable in the next few years.

Despite the collapse of international air traffic in 2020, both Airbus and Boeing managed to continue to deliver widebodies, albeit at a much lower level than 2019. Airbus delivered – not manufactured – 82 widebodies in 2020 which compared with 173 in 2019 representing a drop of more than 50 percent. The number of orders has suffered with cancellations in evidence, notably 26 A350-900s. Airbus recorded 48 widebody cancellations in 2020.

Although the Covid Event made it much more difficult for some customers to accept deliveries due to travel restrictions, the purchase contracts made it necessary for customers to accept - and pay - for aircraft that had been manufactured. This contrasts with the Boeing experience on the MAX whereby because production was not advancing and due to the extensive hiatus to deliveries, customers could cancel orders at no cost. Airbus and Boeing have continued to manufacture widebody aircraft although not all have been delivered leaving a significant number parked. Where customers have received aircraft, some have been placed straight into long term storage. This combination of new widebody aircraft delivered but in storage and aircraft that have

been manufactured but not delivered, makes it much more difficult to contemplate that delivery rates will recover in the near term.

More importantly, with nearly twelve months having elapsed since the full effect of the Covid Event became apparent, customers will have had the opportunity to alter delivery schedules for aircraft that were due to be delivered in 2021 and thereafter. While a deferral will likely see an impact on the final delivery price due to further escalation, at least this obviates the need to consider actual cancellation and therefore the loss of deposits and progress payment. Cancellations, however, have still been recorded as customers. The ability to defer widebody deliveries beyond 2021 therefore means that production rates in the next few years will be significantly below pre 2020 levels. This causes problems for the manufacturers in terms of staffing and sub-contract costs. The expense associated with redundancies, particularly in Europe, can be exceptionally high with staff being retained in “ghost positions”. Moreover, the loss of experienced staff member makes it more difficult to ramp up production once again. Many contracts with suppliers will have been on the basis of certain minimum quantities and a reduction could see an increase in the unit cost of manufacturing the few that are being produced. Airbus and Boeing may even have to continue to accept component deliveries, thereby increasing stock levels. The economies of scale will have been greatly diminished. The need to generate revenue remains as development costs need to be recouped. The reduction in delivery rates is of benefit for the used market as this ensures that the recovery will see used aircraft being returned to service rather than being satisfied by new aircraft.

Airbus and Boeing are therefore under pressure to sustain deliveries and this may involve much more attractive pricing for customers willing to take aircraft in the next two years. Such a reduction in net pricing will have an impact on

	Airbus Deliveries		2020-2019
	2020	2019	Change
A330-200	5	7	-2
A330-200F	0	0	0
A330-300	1	5	-4
A330-800	3	0	3
A330-900	10	41	-31
A350-900	45	87	-42
A350-1000	14	25	-11
A380	4	8	-4
Total	82	173	-91

	Airbus Orders		2020-2019
	2020	2019	Change
	1	-5	6
	0	-1	1
	-6	-4	-2
	1	6	-5
	-7	93	-100
	-5	22	-27
	-6	10	-16
	0	-70	70
	-22	51	-73

values. For actual cancellations of aircraft that are due for imminent delivery, Airbus and Boeing will have considerable pricing flexibility because of the deposits and progress payments received which will not be returned to the customer.

The manufacturers may also opt to eliminate the development portion of any sale price, seeking to reinstate this for deliveries in future years. While the manufacturers may be less willing to accept substantive discounts for new aircraft orders scheduled for delivery in the mid 2020's, they will be much amenable when considering deliveries this year through to at least 2023. The values of new widebodies have tumbled because international traffic as of November according to IATA was still some 88 percent lower than in November 2019 and 67 percent lower for the year through to November 2020. With the resurgence of the virus, the mutations, the time needed to implement vaccinations, the reabsorption of newer stored aircraft, the increase in load factors, and the rise in utilization, there will continue to be very limited demand for widebody aircraft.

A restoration of longer haul international traffic is not dependent on testing or cabin containment measures but on Vaccination requirement for all passengers and crew. Testing and containment have not proved effective. The necessity for "Pax Vax" (Passengers Vaccination – "pax" being the industry abbreviation for passengers) is already becoming more evident with Qantas announcing that vaccinations will be a pre-condition for travel when it restores international services. Pax Vax may also be used in conjunction with accurate testing. Delta is now indicating that the Pax Vax will be pre-requisite for restoration of confidence. An electronic vaccine passport is already under development. With such vaccinations, passengers and governments will become more comfortable in restoring less fettered international travel. The potential for nutation remains ever present, however. Until the Vaccination Passport becomes the standard, then the recovery will remain essentially limited to the domestic market such that widebodies will remain on the periphery.

The value of a new A350-900 is still around \$110 million compared to the \$145 million pre-Covid value. A B787-9 similarly has a value of less than \$110 million. The extent of discounting on new widebodies for deliveries in the short term will be of a similar magnitude for the time being. Such depressed new net pricing has a direct effect on used values such that the next few years are not expected to see any improvement. ■

	Active	Stored
A330-200	241	269
A330-300	401	264
A350-900	252	91
B767-300ER	182	179
B777-200ER	161	206
B777-300ER	640	163
B787-8	277	73
B787-9	459	82

Lease Rates Continue to Struggle As Impairment Bites

The lessors continue to suffer from depressed lease rentals as a result of non payment and lease rental reductions.

AerCap, one of the largest of lessors noted in their report for the third quarter "Basic lease rents were \$897 million for the third quarter of 2020, compared with \$1,067 million for the same period in 2019. The decrease was primarily due to lease restructurings, transitions and the impact of airline bankruptcies. Maintenance rents and other receipts were \$91 million for the third quarter of 2020, compared with \$73 million for the same period in 2019. The increase was primarily due to higher maintenance revenue recognized as a result of lease terminations during the third quarter of 2020. Net gain on sale of assets for the third quarter of 2020 was \$7 million, relating to seven aircraft sold for \$63 million, compared with \$41 million for the same period in 2019, relating to 19 aircraft sold for \$561 million. The decrease was primarily due to the lower volume and composition of asset sales." AerCap. Notably, nearly a \$1 billion was introduced for asset impairment in the third quarter alone by AerCap compared with \$31 million for the same quarter of 2019. This write down of asset value was primarily due to the issues surrounding the A330 and B777,

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types that were already pressure before Covid. AerCap also cancelled orders for 24 B737MAX aircraft during the third quarter. The company's effective tax rate for the year is expected to be just seven percent which contrasts with the much higher tax rates of lessees.

Air Lease Corporation noted in its third quarter report noted *"As of November 9, 2020, most of our lessees have requested some form of accommodation. We evaluate such requests on a case-by-case basis and have agreed to accommodations with approximately 58% of our lessees.....The majority of the deferrals are to be repaid within 12 months from the date the deferrals were granted, and in many cases, include lease extensions. Through November 9, 2020, we have agreed to defer approximately \$201.5 million in lease payments, of which \$59.8 million or 30% of the total deferrals have been repaid..... Our collection rate for the three and nine months ended September 30, 2020 was 86% and 89%, respectively. We expect that our collection rate will remain under pressure because of the impact of COVID-19. We did not recognize rental revenue of \$25.3 million during the quarter because collection was not reasonably assured with certain lessees."* ALC.

The longer the Covid Event is in evidence with limited revenue generation and high expenses, the more difficult it will be for some lessees to repay deferred lease payments and to continue to pay rentals agreed pre-Covid. Virgin Atlantic may need another \$1.35 billion to survive if demand is not restored soon. Funds of \$1.6 billion were secured in 2020 some of which is shortly due for repayment.

LOT Polish Airlines is to reduce its workforce by a further 300 employees. LOT indicated that the number of redundancies was limited as a result of securing significant concessions from aircraft lessors. The airline is due to receive nearly \$500 million in state aid. The lessor CALC has started legal proceedings against SaudiGulf Airlines regarding lease payments for three A320s. The carrier has seemingly failed to pay \$2.58 million for each of the three aircraft for the period April to October 2020. The airline has also not apparently paid between \$112,000 and \$116,000 in maintenance costs per aircraft. The airline has three A320neos that are currently in storage due to be leased from CALC. Air India has been ordered by a UK court to repay \$17.6 million in unpaid lease rentals also due to CALC. SpiceJet was also sued in 2020 for \$27 million due to unpaid rentals on six B737's (three B737-800s and three B737MAX). The lessee was paying \$220,000 per month to BOC Aviation and \$342,000 per month to another lessor for its parked B737 MAX aircraft. Late payments were reportedly in evidence as from April 2019 with the operator waiting to receive compensation from Boeing due to the MAX grounding.

With a sustained reduction in net rentals, this will continue to weigh on the values of aircraft and inevitably cause lessors to introduce more impairment charges for some of its fleet, at least assuming that appraisers that are used consider that there has been some reduction in value. Some appraisers consider that there has been a negligible fall in the values of newer widebodies. Any impairment may be more a function of accounting requirements in specific jurisdictions and as such are not necessarily elective. The cash flow generated by existing leases, and onward estimation of lease rentals, may also be a factor in determining any impairment which may not necessarily relate to a fall in market value. ■

Auction of A340-200s Sees \$500,000 Sale Price

Two French Air Force A340-200s have been sold via an auction with the sale price exceeding by five times the original reserve price.

The two A340-200s built in 1995 originally had a reserve price of under \$100,000. The aircraft had been kept in an airworthy condition but even in such a condition the aircraft were expected to be scrapped given the lack of demand. The condition of the sale on the 22nd December 2020 included an 11 percent sales tax and that the aircraft had to be removed from Charles de Gaulle airport by the end of December. Within a month the markings and logos associated with the French Air Force (Armée de l'Air) had to be removed.

The reserve price was set at \$98,000 per aircraft but serial number 75 was sold for \$540,000 and serial number 81 for \$490,000. The value of a commercial configured A340-200 is still in excess of \$1 million but only just.

The value of commercial aircraft used for military purposes has always tended to be lower because of the potential for differing specifications and uncertainty as to their use. The airworthiness approval can also differ for military aircraft. ■

Spare Engine Prices Continue to Stall

The issue for spare engines values lies with the imbalance between supply and demand with the widebody engines particularly impacted.

The value of a spare used CFM56-7B26 engine prior to the Covid Event could easily be in excess of \$5 million which was a result of the imbalance between supply and demand. With the demand for the B737-800, not least due to the grounding of the MAX, the value of spare engines remained consistently high in the years immediately preceding the Covid Event. Shop visit slots were coming harder to find, and this resulted in engines remaining off wing for that much longer, exacerbating the shortage. With high utilization, more shop visits were in evidence.

The Covid Event has reversed the very factors that led to strong used spare engine prices. Aircraft are in storage en masse. There are over 1,400 A320ceos still in storage along with nearly 400 A321ceos and 770 B737-800s. The situation for the widebodies is even worse with 179 B767-300ERs in storage as of the beginning of 2021 compared to 182 in active service. The high level of storage means that engines can be removed from parked units. This will be a particularly significant for those operators who are experiencing a major loss of revenue. The overhaul of a CFM56-7B26 can cost in excess of \$3 million with a full set of LLP's costing the same amount. To some extent, the overhaul facilities have reduced labor rates which has reduced the cost of overhaul. The level of utilization will also have fallen for many operators, particularly those using the aircraft as preighters which may only see one rotation a day.

The issue therefore becomes one of oversupply. Instead of there being a shortage, an oversupply has been in evidence. Even ignoring the cannibalization of stored aircraft, it would normally be expected that spares would represent some 7-10 percent of the installed fleet. For example, there were nearly 7,500 V2500-A5 engines built with some 800 available as spares (a number of A320s were scrapped before Covid adding to the spare engine pool). But with nearly 1,000 V2500 powered A319neo, A320ceo and A321ceos in storage, the 800 spare engines now support a fleet of only 2,000 aircraft or 4,000 operating engines instead of the normal 3,000 aircraft or 6,000 engines. The active to spare engine ratio is now 20 percent. This level of surplus does not take into account lesser utilization or removal of engines from parked aircraft.

The negatives affecting engines means that units are being acquired for much lower pricing. A CFM56-7B26 may now have a value of nearer \$3 million instead of the previous \$5 million. Such acquisition will make it much more acceptable to lease the engine out at the now inevitably lower rate. Prior to the Covid Event, engine lease rentals increased by some 20-30 percent in the previous few years but this premium has been lost. A sustained lower lease rental for spare engines has a direct impact on values and pricing. As the market improves and the negatives turn positive once more the values will increase although this takes time, perhaps two to three years for narrowbody powerplants and four to five years for the more popular widebody engines. In the interim values of used spare engines such as the V2500 and CFM56 are estimated to have to fallen by at least 30 percent with widebody engines experiencing an even greater drop. ■

Regional Jet Lease Rentals

Regional Jet Lease Rentals Stumble

There is a perception that because traffic has fallen, operators are rushing to use smaller regional jets but this is relevant to only a few operators.

Where operators already have regional jets in their fleet they are tending to use them to a greater extent but others prefer to use larger aircraft less frequently. The trip cost is important and here regional jets offer a saving over mainline jets, assuming that the operator has a choice of equipment and should

As of mid-September, there were approximately 3,100 regional jets in active service; this compares with 2,129 that were in storage and 378 that were undergoing maintenance. Another 16 were being converted. As of January 2021, 3,327 were in active service, 2,071 were still in storage, 299 were in maintenance, 19 were being converted. The number of regional jets therefore still in storage amounted to a 38 percent of the combined active plus storage number, only marginally below the 40 percent of widebodies that are in storage. Approximately a third of narrowbodies are in storage.

There has also been a perception that because the regional jets are more suited to lower traffic levels, the number of cancellations are fewer. This may be correct in an absolute sense but the number of orders for regional jets in the first instance is that much lower. Regional jet manufacturers may be more amenable in allowing customers to "flex" their orders. Orders cannot in any event be easily cancelled but deliveries can be deferred. There has also been no rush by operators who do not operate regional jets to acquire such equipment either on a new or used basis. The very mothballing of the SpaceJet points to very limited demand in this segment of the market. Lease rentals of regional jets experienced a 30 percent or greater fall nearly a year ago and have only increased very slightly from such lows.

Lease rates courtesy of The Aircraft Value Analysis Company Limited (AVAC). www.aircraftvalues.net; www.aircraftvalues.com. ■

Aircraft	Age	Rentals	Trend Analysis
Avro RJ85	1993-1997 1997-2001	25-46 29-60	The number of RJ85s in storage is greater than those in active service which is perhaps no real surprise as this was virtually the case before the Covid Event. There are ten operators operating 20 aircraft and Aero Flite use six in the fire fighting role which means that these will never be returned to commercial service. To a large extent it is a surprise that the aircraft remain in service but four engines does mean good performance. Moreover, the aircraft can be ferried should one of the engines fail. Despite the competition of the twin regional jets there is still a place for the RJ85. Lessors will be looking at lease extensions wherever possible although this will see a lower rental.

Avro RJ100	1993-1997 1997-2001	25-50 30-65	Again, there are more in storage than active service, 18 versus 28 with ten operators actively using the aircraft. The aircraft has long since been moved away from mainstream operators and is dependent on secondary or specialist users. The lease rentals are highly dependent on the length of the lease and the credit standing of the lessee. There are few in any event that are actually leased through a vanilla operating lease. Falko had a number on lease but these were scrapped in 2017.
CRJ200ER	1996-1999 1999-2004	10-25 15-40	The CRJ200ER and LR continue to provide good service but in a Covid era the small cabin size is perhaps not the most inviting for passengers seeking virtual self-isolation during "essential" flying. The number of aircraft in active service number just over 300 with slightly more in storage. Another 68 are undergoing maintenance. The aircraft has been facing pressures ever since the market recovered from 2001 and production ceased. The aircraft is good for some routes and the absence of any new production for nearly 15 years makes it necessary to seek used equipment which is perhaps why so many are still in service. Long term lease agreements may also have played a role in determining retention beyond what may have been the norm.
CRJ700	2000-2010 2010-2016	35-80 70-120	This type typifies the current market where more have been employed due to low trip costs and lesser traffic. With 38 percent of the regional jet fleet in storage only 18 percent of CRJ700s are parked with another 26 undergoing maintenance. This signifies that demand is indeed focused on regional jets but only where an existing operator has such an aircraft in their existing fleet. There has been no widespread acquisition of such aircraft by third parties anxious to reap the rewards of exceptional demand. Lease rentals have therefore suffered just as much during this downturn as other regional jets and once the recovery occurs, they may well be cast aside as being too small. The very absence of orders in nearly a decade points to a limited market.
CRJ900	2002-2012 2012-2021	40-95 70-135	Again, the CRJ900 is enjoying the change in demand patterns due to the Covid Event with some 15 percent or less of the fleet in storage. The size of the aircraft makes it more suitable for lower density seating as some operators have expressed a desire not to exceed 60 percent load factors due to Covid. Operators in the U.S. had previously ordered the type because of the artificial restrictions imposed by scope clauses. Scope clauses limit the weight of regional jet aircraft and the number of seats. Production has ceased. Despite the positives, the lease rentals fell by a significant amount and have not recovered to any great extent.
CRJ1000	2009-2015 2015-2019	70-120 95-135	A third of the fleet is in storage although the actual fleet size is limited anyway with production having effectively ceased some time ago. Because the CRJ1000 exceeds the scope clause limitations, the type was more targeted to non U.S. customers. The lease rentals have experienced a significant fall with rates virtually the same as those for the CRJ900. The lessors include NAC, HEH and Rockton. The last CRJ1000 to be moved between operators involved serial number 19049 in November 2019 which saw a move from Air Nostrum to Hibernian Airlines leased by HEH Aviation.
ERJ135	1999-2005	15-35	Some two thirds of the fleet is active with a number being used as corporate shuttles. The disappearance of so many routes and the desire to be Covid secure has likely increased the number of corporate shuttle flights. The 30 seat commuter jet was always a difficult proposition as a single customer can make the difference between profit and loss. The fleet is limited in size and with no immediate prospect of a replacement, operators have little option but the ERJ135 if they wish to service a route with a 30 seater jet. Rolls-Royce TotalCare can have a very marked impact on marketability such that placement with it can be that much more difficult.
ERJ145	1999-2002 2002-2006	15-30 20-40	There are many designations of the ERJ145 including the EP, ER, EU, LI, LR, LU, MP, RS, SA, SM, and XR. These denote differing weights and avionics. The aircraft though, are all essentially the same. Like the CRJ200ER there are just as many in storage as there are in service. The type is now over 20 years of age and this inevitably means that retirement looms large. A direct replacement is not in evidence which reflects the desire to increase capacity over the last 15 years. The type is suited to the U.S. market where a hub and spoke system still has some relevance with the majors relying on the regional operators to feed traffic for the denser routes.
E170	2003-2009 2009-2015	40-85 65-110	If the regional jets were in such demand during the Covid Event then why is a third of the E170 fleet still in storage? The E170 was already in the doldrums even before Covid because of the move and switch to the larger E175 which nudged the scope clause barrier. The type still has some utility, but the operator base is below 20 which is a concern for remarketing. The lack of an E2 version underlines the issues with this type of capacity.
E175	2004-2012 2012-2021	45-105 80-135	The E175 is the aircraft that is seen as the poster aircraft for the regional jet market during this emergency with a very limited number actually in storage. The U.S. operators have kept the aircraft in service as it offers a lower trip cost while allowing for a reasonable load factor. Using a mainline aircraft can see much higher trip costs particularly if the number of passengers remains the same. The E175 lease rentals have therefore improved slightly but it has to be noted that this type is firmly the preserve of the U.S. market mainly if not solely, due to the scope clauses. As demand returns, then the E175 may not be seen in the same light. The delay to the service entry of replacements by Embraer and MRJ clearly indicate that this is not such a strong segment of the market.
E190	2005-2011 2011-2019	55-120 90-150	The market for the E190 is not improving but it must be noted that some are transitioning between lessees perhaps because of the significant fall in lease rentals. Nearly 40 percent of the E190 fleet is still in storage, thus illustrating the issues surrounding the type. The aircraft was already facing problems before Covid and the modest improvement in domestic and regional traffic has not resulted in any significant improvement in figures. The operator base is extensive at more than 60 which has been facilitated by the expansion of the operating lessors in this segment of the market. Lessors will be seeking to extend leases or if low rates are necessary, these will be offered on the shortest of terms. The very operators that would be hoped to take additional used aircraft are the very ones seeking to replace them. The E2 is more than just a re-engining exercise and this ensures clear water with the existing E190.

E190E2	2018-2021	145-210	The E190E2 has seen a modicum of orders but the regional jet segment of the market has always been plagued by a “you build it and they will order a few” aspect whereas the A320 and B737 has seen a “you merely suggest it and they order thousands before seeing the specifications” event. The E190 is more an modest upgrade and now that Embraer no longer has Boeing, there will be an incentive to ramp up the sales activity such that the E190 may be displaced. The lease rentals of the E195E2 suffered to a lesser extent than other Embraer products because it was so new.
E195	2006-2012 2012-2018	65-125 95-150	The E195 is seeing some 25 percent of the fleet in storage which is considerably better than the E190 perhaps. The size of the aircraft is quite large which makes it possible to space out passengers. The type has been replaced by the larger E2 version and the Covid Event has complicated any remarketing efforts. Some aircraft are seeing a return to service but not as many as might have been hoped for illustrating the difficult in restarting non domestic services and overcoming the reluctance to travel that is now so obvious.
E195E2	2018-2021	155-230	The E195E2 has only recently entered service and as such the rates fell by a lesser amount than earlier types. Operators of the type will seek to bring these aircraft into service before the E1s given the far better efficiency. The market for the type is very fragile and there may now be a temptation for Embraer to seek to discount aircraft to maintain production that must otherwise be reduced.
328JET	1999-2002	10-30	There can be no escaping the issues affecting the 328Jet but there are many used in a non commercial role so storage is not so obvious.
Fokker 70	1994-1997	20-50	While there a number in storage there are also a greater number in service. Where domestic travel is still possible then the type has utility but for the short term rentals are impacted.
Fokker 100	1987-1996	20-50	Nearly a 100 seem to be in storage not all of them due to the Covid event.

Heavy Business Jets

Gulfstream Values Experience Some Stability

The business jet market is showing some signs of stability in terms of values although in the immediate aftermath of the Covid Event there was something of a knee jerk reduction in values as restrictions took hold only to

then see a quick recovery.

In the third quarter of 2020 GAMA reported 134 deliveries of business jets compared with the 114 of the first quarter and the 130 of the first quarter. The peak of the market for new business jets was in 2008 when 1,306 were delivered. After the financial crisis, business jet deliveries experienced a significant decline and while 2019 seemed to show an improvement this was mostly a function of the delivery of smaller business jets. In the first nine months of 2020 Gulfstream has seen a stability in rates from 23 in the first three months compared to 32 in the second quarter and 32 in the third quarter. The number of Bombardier business jets increased from 20 in the second quarter to 24 in the third.

In terms of business jet flights then these are only slightly down compared to 2019. For the last week at the end of December 2020, the number of business jet flights was up by seven percent compared to the same week in 2019 – 7,491 versus 6,999. More than half of all business jet flights take place within the USA. Gulfstream aircraft performed 1,036 flights in the 19th December compared to 867 for Bombardier aircraft, 901 for the Falcon and 864 for Embraer models. The number of flights between the US and other countries also increased by some three percent compared to the same week in 2019. Europe to Europe flights increased by nearly 26 percent compared to the same week in 2019. The Covid Event is inevitably causing business passengers and those that normally travel first class to consider dedicated business jet travel. The most significant fall in business jet operations occurred in mid April 2020 when the number of business jet flights fell by 75 percent only to recover to pre Covid levels by July.

Values courtesy of The Aircraft Value Analysis Company www.aircraftvalues.net; www.aircraftvalues.com. ■

Heavy Business Jets; Current Market Values – January 2021

Aircraft	Age	Value US\$m	Trend Analysis
Bombardier Global 5000	2006 2012	6-8 12-16	The Global 5000 has seen a fall in the last few months as the market has experienced a measure of weakness with values of the younger aircraft experiencing a significant fall. Some five percent of the fleet is being advertised for sale which is below the overall average for the larger business jets. A new Global 5000 in 2019 may have had a list price of \$50.5 million but this bears no relation to the price today which is fortunate to be \$33 million. This represents a very significant decline for a new aircraft. Between 2012 and 2016 prices of the Global 5000 fell by some 50 percent. The arrival of the Global 6500 and 7500 represent significant improvements to the Global range. At these prices the Global 5000 represents something of a bargain.
Bombardier Global 6000	2013 2017	17-22 24-29	The values of the Global 6000 have also experienced a fall of ten percent in the last few months but the level of availability is quite low at six percent. Owners of the larger business jets usually retain their aircraft for some five years before trading in for a newer model. As the Global 6000 was introduced in 2012 the fleet is relatively young. A new 6000 may have had a price of \$62 million in 2019 but today to achieve a price of even \$35 million is doing rather well. Hopefully buyers of the 6000 in the last few years will have secured considerable discounts. In any event the depreciation profile on the asset will need to be amended which for some companies will be attractive due to the tax implications.

Bombardier Global 7500	2019	55-62	The values of the 7500 have declined even if service entry was first effected two years ago. The aircraft has considerable capability in terms of range and capacity but buyers may be less willing to upgrade so quickly. There is only a single example being advertised for sale. There can be expected to be attractive pricing on new aircraft. The list price may be in excess of \$75 million but already a two year old aircraft may be worth less than \$55 million.
Bombardier Global Express / XRS	2001 2005 2010	5-7 7-9 13-15	The values of the GE and GE XRS have experienced a further fall perhaps because the level of availability has increased to more than ten percent for the GE and to 12 percent for the XRS. Much depends on the specification of the aircraft and the utilization. The Global Express and the XRS represent true bargains for those owners who do not need the latest offerings or absolute range. The pricing may be a shadow of their original cost but at these levels any decent lottery winner can afford to acquire and operate the type. For a 2004 vintage aircraft the price was \$25 million in 2013 but this fell to \$16 million by 2016 and today the value is likely to be only \$7 million. The XRS was last delivered in 2012 and such vintage aircraft still manage to attract pricing in excess of \$15 million even if when originally delivered they cost nearly \$60 million.
Bombardier Challenger 605	2008 2012	5-7 7-9	After experiencing an improvement in fortunes values of the Challenger 605 have fallen once more. The level of availability has declined slightly to nine percent compared with the previous level of eleven percent. The aircraft does not have the range offered by some types but for those owners requiring medium haul capacity the type is a good solution. However, for those owners who have owned the aircraft since new there can only be relief that pricing has stabilized but disappointment at such a rollercoaster ride. The pricing needs to be seen in the context of new prices of \$30 million or more so the decline in only five years is significant. For those able to write off the depreciation against tax, this may not be such an issue. For other owners, the 70-80 percent fall in value can represent a problem if they are needing to maintain a certain equity percentage in the aircraft.
Bombardier Challenger 850	2010	5-7	For the Bombardier, the 850 has seen little movement in values. Owners had previously taken some comfort in that for the last four years, pricing has been relatively steady. A 2015 850 may have originally cost \$30 million but today – only five years later – the value is less than \$10 million representing a 65 percent fall. For those not needing absolute range, then this represents a bargain.
Dassault Falcon 7X	2009 2012	14-16 18-21	The values of the younger 7X aircraft have suffered a modest decline but it has to be noted that in previous years, the fall was significant. A 2017 7X had a new price of \$53 million but today this is half that amount despite the level of availability being some seven percent. The number produced in recent years has been small and Dassault are in the midst of developing new types. The three engine configuration is naturally an issue but a positive for some operators.
Dassault Falcon 900LX	2011	14-16	The values of the Falcon 900LX have fallen by a small amount but not the extent felt by other types perhaps because the market is skewed away from the U.S. Customers tend to remain with the same manufacturer, preferring to seek out the same sales person even if a better deal may be achieved with another manufacturer. Some regions of the world also have an affinity to the Dassault brand. The three engines of the 900LX comprise the TFE731-60. The aircraft represented a major improvement over the 900B. In an era of twin engine business jets, the three engine Falcon 900LX may seem something of an anomaly. However, three engines provide for considerable safety on long haul trips and there are certain countries in the world that prefer to buy the aircraft. The level of availability at ten percent is slightly higher than might be preferred as disposal times will likely increase as a consequence.
Dassault Falcon 2000LX	2012	12-14	The market has been less kind to the Falcon 2000LX in the last few months with a notable fall in value. The aircraft has a lower than average level of availability. The two engines are attractive and there are many clients around the world who favor the style of the Falcon as well as the relationship with Dassault.
Embraer Legacy 650	2014	12-14	The Embraer Legacy 650 has provided owners with considerable adventure in terms of changes in values but of late there has been lesser change. The value of the 2014 aircraft was \$15 million in 2017 and today it is only slightly lower and on that basis the aircraft has been a good investment – at least if a used aircraft was bought in 2016 after the collapse in pricing. The fall in 2016 caused considerable problems for lenders and borrowers alike as the outstanding loans exceeded the market value by a considerable margin in some cases. The arrival of the 650E is a concern.
Embraer Lineage	2012	16-19	The Lineage 1000 is an acquired taste but even so values have remained stable in the last few months. The type is perhaps too large for many business jet operators unless they wish to use it for a larger entourage or corporate shuttle. The Lineage offers considerable capacity. The largest of the Embraer business jets, the Lineage 1000E would seem to represent a serious challenger to incumbent types but the market is never that easy.
Gulfstream V	2000	7-8	The values of the GV have eased down slightly but not too much. Some nine percent of the fleet is on the market, not too dissimilar to a few months ago. At these prices the aircraft represents a good investment particularly if utilization is low which will see lesser wear and tear and maintenance.
Gulfstream G450	2010	10-13	Again the values of the G450 have remained stable with less than nine percent or 31 aircraft on the market. The G450 is derived from the ubiquitous GIV. The market for the type previously saw a precipitous decline before enjoying something of a revival. An engine support program is vital for values otherwise expect a significant discount.
Gulfstream G500	2007 2019	8-10 32-36	The values of the RR powered version have declined by a modest amount but not by too much. Those in better condition will be the more attractive. The G500 has been re-engined with the PW800 series engine and values of those built in 2018 have experienced to reflect more difficult market conditions. Just as the G450 is a product of the GIV then the G500 is a development of the GV. The G500 is a reduced range version of the G550 but thus far the lesser range has not adversely affected values.

Gulfstream G550	2010	15-18	The decline in values of the G550 has not been as great as for other types perhaps because availability is that much lower at less than five percent. There can be some variation depending on the specification and condition of the aircraft. The G550 cost more than \$56 million when delivered new in 2012 but values suffered significantly in 2015 and have suffered since then on occasion not least as new models have emerged.
Gulfstream G650	2013	28-33	The values of the G650 fell during 2020 but have more recently stabilized. There are only some 10 on the market representing less than three percent of the fleet. The values have nonetheless fallen by some 50 percent over the course of the last seven years. The type is now competing with newer models which nearly always serves to force a discount in the values of existing equipment. A non-ER G650 will see pricing some \$2 million less than for a -650ER.
Gulfstream G700	2022	72-75	The G700 is on its way and promises to be a formidable aircraft when compared to the current stable.

Commentary reflects Values as of September 2020.

Aircraft Value Review—CRJ900

CRJ900 Values Stable After Massive Fall

There are now only some four CRJ900 remaining to be delivered before production ceases.

A total of 500 CRJ900s have been delivered with 381 being in active service, 78 in storage, 27 are undergoing maintenance, three have been scrapped, four are on order, and five are beyond repair. Two of the four aircraft remaining to be delivered are due to be delivered to Chorus Aviation in Canada, one to Delta, and one to Dow Chemical. The largest operator of the CRJ900 is Endeavour Air with a fleet total of 123 aircraft of which only 16 are inactive. The operator base comprises a number of non commercial operators. The concentration of the CRJ900 in the U.S. is notable not least because the majority were ordered to meet the requirements of scope clauses and therefore have lesser utility outside of the U.S. The CRJ900 has a weight of 84,500 lbs for the LR version with a capacity of 76-90 passengers but for scope clauses this is effectively limited to 76 seats. American Airlines scope clause allows aircraft with more than 65 seats to equate to no more than 40 percent of the mainline narrowbody fleet. For Delta, only 153 76-seat aircraft can be operated along with 102 70-seat aircraft. For United, there is a limit of 153 76 seat aircraft and no more than 255 aircraft between 51 and 76 seats in total. The issue for the CRJ900 is where the demand exists outside of the U.S.

The CRJ900 has been a good seller for Bombardier and represents the majority of CRJ aircraft now being delivered. Production will cease in 2021 after the program was acquired by Mitsubishi Heavy Industries in 2019 which was finalized in 2020. The CRJ program was acquired for \$550 million in cash and the assumption of \$200 million in liabilities. MHI acquired the maintenance, support, refurbishment, marketing, and sales activities for the CRJ.

Virtually as soon as the first CRJ100ER entered service with Lufthansa - if not before - some existing and potential customers sought a larger version of the CRJ200 aircraft. While the 50 seat aircraft was initially able to achieve reasonably low unit costs in an era of lower fuel costs, a 70 seat version allows for even lower costs and greater operational flexibility. Increasing the size of an aircraft, rather than shortening an existing design, is usually easier assuming that the same wing can be used. Shortening an aircraft, while perhaps offering improved performance, makes it more difficult to reduce the weight and may therefore result in higher en-route charges. The CRJ700 or CRJ701 was then joined by the CRJ705. The stretch to the CRJ700 was announced in 1999, designated the CRJ900. The assembly of the aircraft began in 2001 with the first flight taking place the same year. In 2003 the first aircraft was delivered to launch customer Mesa. The CRJ900 retained similar features to the CRJ700 and therefore has extensive commonality as well as cross crew qualification with the CRJ200, CRJ700 and CRJ1000.

The CRJ900 features two fuselage plugs compared to the CRJ700, one aft and one forward, increasing the seating capacity to a maximum of 90 seats, nearly the same as the Embraer E175. When compared to the CRJ700, the CRJ900 features a five percent increase in engine thrust, strengthened main landing gear, upgraded wheels and

Operator	Active	Inactive	Total	Outstanding
Endeavor Air	107	16	123	1
PSA Airlines	69	0	69	0
Mesa Airlines	53	11	64	0
SkyWest Airlines	37	6	43	0
China Express Airlines	38	0	38	0
Lufthansa CityLine	23	12	35	0
Jazz Air	25	8	33	2
CityJet	8	12	20	0
Xfly	4	8	12	0
Iraqi Airways	3	3	6	0
Ibom Air	4	1	5	0
Air Nostrum	0	4	4	0
Arik Air	0	4	4	0
Uganda Airlines	4	0	4	0
Libyan Airlines	1	2	3	0
Petroleum Air Services	2	1	3	0
RwandAir	1	1	2	0
Syphax Airlines	1	1	2	0
CemAir	1	0	1	0
Dow Chemical	0	0	0	1
Total	381	90	471	4

brakes, a strengthened wing, increased volume in the forward underfloor baggage hold, an additional underfloor baggage door and two additional overwing exits.

CRJ900 & CRJ900NextGen Vital Statistics					
LAUNCH	1999	STANDARD MTOW	80,500lbs	LIST PRICE (2017)	\$46.5m EST
FIRST FLIGHT	02/2001	OPTIONAL MTOW	85,000lbs	TYPICAL DISCOUNT	50%
SERVICE ENTRY	05/2003	FUEL CAPACITY	1,488 liters	VALUE 2002	\$2.8m
ORDERS	500	RANGE STD	938nm	VALUE Y2009	\$7.0m
DELIVERIES	496	RANGE	1,553nm	VALUE TREND	Falling
BACKLOG	4	SEATS – 1 CLASS	90	2023 F/V – Y2006	\$4.0m
OPERATORS	20	CARGO	590cu ft		
ENGINE TYPES	CF34-8C5	T/O FIELD LENGTH	5,775ft	LEASE RATE– DoM 2006	\$70,000pm
VARIANTS	-900, -900NG Challenger 890	MZFW-STD	70,000 lbs	RENTAL TREND	Stable
D CHECK COST	\$800,000	OWE-STD	47,252 lbs	2023 LEASE RATE –DoM 2006	\$65,000
ENG O/H COST	\$1.0-2.8m	CABIN WIDTH	100 inches	AIRCRAFT RATING	D+

For quicker airport turnaround, an additional service door was placed at the aft starboard side of the fuselage providing access for aircraft cleaning and galley replenishment crew, while passengers disembark through the forward passenger door. In 2007, the CRJ900 upgrade was announced in the form of the NextGen. Along with other members of the CRJ family, the CRJ900NextGen features new cabin interiors including larger passenger windows, greater baggage space and power saving LED lighting. Enhanced winglets are fitted for improved performance and lower fuel burn. The engines were also improved such that a 5.5 percent fuel burn saving was achieved compared to the CRJ900. The CRJ900 also used more resin transfer molding (RTM) composites in the construction resulting in reduced fuel consumption. The first CRJ900NextGen entered service in 2007 and American Airlines received its first unit in 2014. The CRJ900 has a range of 2,956km. Bombardier has also introduced a long-range version, CRJ900LR, which will have a range with a full passenger load of 3,385km, taking off from a 1,944m runway. The CRJ900ER European had been designed for services to European airports. The aircraft has a reduced maximum take-off weight (36,995kg as compared to 37,421kg for the CRJ900ER) to minimize the weight-sensitive charges at European airports. From 2005 the CF34-8C5 became available providing additional thrust. Through tech insertions, the engine can be interchanged between the CRJ NextGen family and a single pool of engines can be maintained. There are two integral wing fuel tanks, with a fuel capacity of 1,488l.

One of the key factors affecting residual factors, particularly where a new aircraft or market segment is involved, is in the potentially rapid change in both aircraft specification and demand structure. Both Embraer and Canadair moved away from the baseline models to produce aircraft with longer range, greater payload, better airfield performance and more recently, greater capacity. Though this is just as much a function of the evolutionary nature of engine technology, where new designs need in service experience and time to produce greater thrust and improved reliability, it is also a function of aircraft design and a demand from customers.

Minor variants can also be produced as a means of stimulating a few extra sales for little additional investment. The result can be a dilution of the product line and marginalization of certain variants. Over time the difference in residual value can be much larger than the original differential due to the problems associated with remarketing. With the regional jet market, the dilution of the product line and marginalization of some variants is already evident. ■

Aircraft Asset Assessment

CRJ900

Market Presence. The demand for the CRJ900 has been notable with a final tally of 500 ordered as of the of production that will occur in 2021. The demand for the 75-90 seats was proven with the F100, the BAe146-200/300/RJ85 but the CRJ900 brought new operating economics. While the concentration with US customers is of particular concern, the number of orders for the type represents a credible achievement in view of its variant status. The move away from the 50 seat regional jets had been in evidence for some years and the 76 seat, 84,500lb scope clause compliant CRJ900 displaced some CRJ200s and became more favored than the CRJ700. As a derivative of the CRJ200, the CRJ900 retains the long thin tube effect which is not always welcomed by passengers particularly in the Covid era but this has not prevented operators from fully utilizing the aircraft. The advances made with the NextGen version sought to enhance the passenger experience, thereby providing an alternative to the ERJ175. The issue of scope clauses created artificial demand. The effect of Covid was to see values fall by more than 30 percent which

was in addition to the recent declines that were seen as a result of heavy discounting by Bombardier as it sought to maintain production.

Market Outlook. Production is ending this year and delivery rates have been negligible in recent years. Embraer has developed the E2 series for which Bombardier has no response given its preoccupation with the CSeries but the E175E2 is now delayed. The MRJ is an all-new aircraft and encompasses variants which further threaten the CRJ900 but this has been mothballed for the time being. Whatever the future of the CRJ, a replacement will be needed which offers either a new engine or an all-new aircraft. Both options will be a negative for the CRJ900. The expectation is that the preference will continue to be for regional jets with more than 70 seats given the availability of turboprops unless scope clauses in the U.S. continue to dictate ordering patterns. In the years ahead, the move away from the 50 seaters will likely increase the potential for the CRJ900. Values experienced a marked fall in recent years and this will continue. ■

Disparate Recovery Expected for A320ceo Values

The values of the youngest A320ceos are experiencing a very slight improvement from the twenty five percent loss nearly a year ago illustrating that any increase will not be universally applied to all A320ceos.

The issue for the A320neo, more so than the B737-800, is that the type has been in production for ten years longer than the Boeing product. This means that the oldest is over 30 years of age already. In any downturn, the oldest examples of a type suffer the most with newer aircraft acting as replacements. There are still some 1,400 in storage which does not take account of those that are being under utilized or load factors. These two factors highlight the difficulty in just examining the storage levels. Load factors still tend to approximate 60 percent compared to the pre Covid Event levels of more than 80 percent. Traffic therefore needs to increase by a substantial amount just to allow operators to be able to fill aircraft. Low utilization also means that there remains considerable slack that needs to be tightened before the majority of those that remain in storage can be returned to service. As such restoration will take time, it can be expected that a number will need to be scrapped as owners and operators recognize the difficulty in achieving a return.

A320ceo Status	Jan-21
Active - all Engine Types	2715
Active V2500	1073
Active CFM56	1642
Maintenance	268
Storage	1413
Crashed	11
Derelict	6
Scrapped	256

The segmentation of the A320ceo fleet shows that there are more CFM56s in storage than V2500s but that there are more active CFM56 equipped units. The number of CFM56s built between 1988 and 2008 and in storage is nearly double that of the

Age Profile	Active			Stored			Active + Stored		
	Total	V2500	CFM56	Total	V2500	CFM56	Total	V2500	CFM56
	2715	1073	1642	1413	533	880	4128	1606	2522
1988-1998	88	40	48	272	98	174	360	138	222
1998-2008	651	302	349	471	231	240	1122	533	589
2008-2015	1369	591	778	572	192	380	1941	783	1158
2016-2021	607	140	467	98	12	86	705	152	553

V2500 powered fleet although it is to be noted that the IAE engine took time to gain traction in the early years of the program. This could suggest that the scrapping of these early aircraft will take time, potentially raising the number of spare engines in the pool. For the midlife A320ceos – those built between 2008 and 2015 – the number of CFM56 powered aircraft in storage is double that of the V2500 suggesting that these could take time to be re-absorbed.

Notably, the number of A320ceos powered by CFM56's and delivered since 2015 is far in excess of those powered by V2500s but the number in storage is far less than other age bans suggesting that these will continue to be placed back into service before older examples. The values of the oldest A320s are therefore not expected to see any recovery and indeed may continue to see further declines. ■

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