

The size of the global narrowbody fleet has increased by half over the past 10 years. 160- to 190-seat aircraft, such as the A320 and 737-800, have seen particularly strong demand. Current market values, lease rates and potential future market trends are discussed here.

# Narrowbody aircraft and engines; values, lease rates and market conditions

The global fleet of passenger-configured narrowbody aircraft continues to grow. The number of in-service narrowbodies has increased by 51% over the past 10 years.

*Aircraft Commerce* has analysed narrowbody fleet developments and market trends from 2006 to 2016. The following summary identifies current aircraft market values and lease rates, highlights engine values, and discusses potential future aircraft value trends.

## Narrowbody market trends

“Demand for narrowbodies has grown dramatically over the past 10 years,” says Stuart Cauff, managing director at Jet Trading and Leasing LLC. “This trend is likely to continue with the introduction of the A320neo and 737 MAX families.”

“Narrowbody annual deliveries doubled from about 500 units in 2005 to 1,000 in 2015,” claims Martin Friis-Petersen, managing director at MTU Maintenance Lease Services B.V.

“The growth of demand for aircraft has almost been universal,” continues Cauff. “Widebodies have enjoyed growth in the larger Middle Eastern flag carriers that concentrate on long-haul services, and also with some airlines in the Asia Pacific. Fleet growth in Western Europe, North America and South America has been dominated by narrowbodies.”

Gary Fitzgerald, managing director of independent financial advisory boutique Stratos, adds that the Asia Pacific has accelerated its acceptance of narrowbodies over the past 10 years.

“Asia’s share of narrowbody deliveries has steadily grown over the past 10 years,” says Friis-Petersen. “It has now overtaken North America and

Europe in terms of deliveries.”

Some of the growth is due to an increased demand for air travel. Cauff believes it is also partly associated with airline network and scheduling strategies, as carriers opt to emphasise the flexibility offered by increased frequencies with narrowbody aircraft, rather than providing the same capacity with fewer flights operated by larger widebodies.

## Aircraft ownership

“More than 50% of narrowbody aircraft are probably leased,” says Fitzgerald. “Investors tend to compare aircraft to other asset-backed investments such as property, shipping and, to a lesser extent, infrastructure. Aircraft values have been much less volatile over the past 10 years relative to other asset classes, which is why more aircraft are being financed via operating leases.”

Narrowbodies have traditionally been more popular with investors than regional or widebody aircraft. “The primary reason for their popularity with lessors is that narrowbodies are core aircraft for most airline fleets,” says Cauff. “This makes their residual values more predictable in their later years than widebodies, which are more sensitive to the global economic circumstances which drive demand.”

“Narrowbodies are still seen as the most liquid investment with low transition costs, relatively homogenous specifications and very large operating bases,” explains Fitzgerald.

“New narrowbodies are very popular, especially since there has been strong liquidity in the investor markets with an appetite for good quality and hard, long-lived assets with predictable cashflows,” says Marjan Riggi, managing director at

Kroll Bond Ratings Agency.

“The mainstay of investors’ portfolios would be 737-800s and A320s, because they form the largest segment of this market,” says Fitzgerald. “Investors look at liquidity with particular interest. That is the realistic chances of placing an aircraft with another operator at the end of its lease term. Any aircraft with a smaller fleet size or highly fragmented engine types will be more of a concern from a remarketability perspective.”

“Narrowbodies with a life-after-death option are most desirable,” says Cauff. “These have the potential to be undergo passenger-to-freighter conversions later in their lives. In many instances these modifications can add 10-15 years of additional useful life to an aircraft.”

Initial lease terms for new narrowbodies can vary. “Lease terms on new narrowbodies have been getting longer,” claims Ryan McKenna, vice president at Air Lease Corporation. “Initial lease terms are typically for eight to 12 years, although we have seen some stretch out as far as 14 years.”

“For new narrowbodies it is rare to see less than eight years for an initial lease term,” says Fitzgerald. “Typically they will be for 10-12 years to align with heavy checks. Secondary lease terms for used aircraft are five to seven years.”

## Engine ownership

“Engine leasing has become increasingly attractive to airlines for the same reasons aircraft leasing has grown significantly over the past 20 years,” explains Craig W. Welsh, senior vice president & chief commercial officer, Americas & Asia, at Willis Lease Finance Corporation (WLFC). “It allows the acquisition and use of high-priced assets

*There has been a trend among narrowbody operators to upgauge to higher capacity aircraft over the past 10 years. 160- to 190-seat aircraft have seen the strongest demand in the narrowbody market since 2006. 737-800s and A320s are the most popular types in this category.*

with little cash outlay, or the freeing up of capital through a sale-and-leaseback. Another reason is that the residual value risk is shifted to the lessor. More than 50% of all commercial aircraft are likely to be leased by 2020, and we expect spare engines to follow that trend.”

Narrowbody engines are the most popular among investors. “Narrowbody aircraft and engines make up most of the orders placed by leasing companies,” says Friis-Petersen. “This is not only because of the higher share of narrowbody aircraft orders in general, but also for risk mitigation purposes. As investors, lessors want to buy aircraft and engines with a broad potential customer base.

Compared to aircraft, engines are considered as liquid and moveable assets that should allow for a quick exit.”

Some narrowbody engines are more in demand from investors than others. “It is necessary to differentiate between engine generations,” says Friis-Petersen. “There are the so-called sunset or mature engines which include the JT8D, CFM56-3, PW2000 and V2500-A1; and current generation engines including the CFM56-5B, CFM56-7B and V2500-A5; and next generation engines that include the CFM LEAP and PW1100G-JM.

“Due to the decreasing demand for mature engines, those types represent an ad hoc opportunity for short-term engine exchange, leasing or teardown, rather than a longer-term investment,” continues Friis-Petersen. “They are, therefore, no longer targeted by typical engine leasing companies, but rather by so-called traders and engine maintenance, repair and overhaul (MRO) providers, which also have a strong interest in using them as surplus engines and/or for accessing serviceable surplus material.

“Next generation engines are yet to be delivered in large enough numbers to become attractive investments as spare engine assets,” continues Friis-Petersen.

“Since narrowbodies account for 70% of all the commercial aircraft in operation today, and because most of these are members of the A320ceo and 737NG families, it is no surprise that the CFM56-7B, CFM56-5B and V2500-A5 series are the most popular aircraft engines among investors,” says Welsh. “These engine types represent the greatest opportunity for placement and remarketing due to their large global installed bases. More than half of



WLFC’s portfolio includes these types. The CFM56-7B may have a slight edge in terms of appeal, since it has about double the numbers of both the CFM56-5B and V2500 which roughly split the A320 market. In other words, the CFM56-7B has the largest installed base with the CFM56-5B and V2500 roughly tied for second and third.”

Typical lease terms for narrowbody engines vary according to the needs of the operator. Some airlines may sell and lease back engines on long-term arrangements to raise capital. Other lease terms may be required to provide cover for shop visits.

## Aircraft value trends

“The primary influences on values and lease rates are demand, engine condition, cost of equity capital and cost of debt markets,” explains Cauff.

There are indications that the number of available engine options can influence narrowbody residual values. “From my personal experience, 737NG family aircraft have a more predictable residual value than A320ceo family types,” claims Cauff. “The Airbus products have multiple engine variants so the residuals for those aircraft are driven by demand for two or three different engine types versus one engine family on the 737NG.”

Fitzgerald notes that the impact of multiple engine options is reduced if there are a large number of aircraft in service: “After a certain volume of aircraft have been produced and operated by 100 airlines, it makes little difference if there are one or two engine options. Single engine options make investment easier, but do not necessarily make for a better investment.”

One trend in the narrowbody market over the past 10 years has been a shift towards larger types.

“Airline demand has moved away from smaller single-aisle variants, such as the A318, A319 and 737-700, to focus on larger aircraft with lower costs per seat-mile, such as the A320, 737-800 and A321,” says Friis-Petersen. “This is a result of high fuel prices at the time orders were made, and increasing list price discounts from Airbus and Boeing for their larger models.”

“Many airlines are upgauging to reduce costs per available seat-mile (ASM), and as long as you have the load factor, it produces more yield,” says Welsh. “This is particularly the case for high-frequency, high-density city pairs.”

“There has been a general trend towards upgauging in Europe and North America, with smaller narrowbody family variants becoming less popular due to direct operating cost economics,” says Robert Korn, president at Apollo Aviation Group.

The narrowbody fleet has been sub-categorised into four capacity groups to provide a more focused analysis of market demand and value trends.

Appraised 2016 current market values (CMVs) and lease rates have been identified for eight-year-old aircraft where possible. This is likely to be the youngest age at which narrowbodies enter the used market, either because they have been returned at the end of an initial lease term or disposed of by the owning operator. CMVs and lease rates for older vintage aircraft are also discussed. Consideration of future base values (FBVs) for 2020 provides an indication of possible value trends to the end of the decade. The FBVs

## NARROWBODY AIRCRAFT FLEET TRENDS 2006 - 2016

Aircraft Type	In-service			Stored			Total		
	2006	2011	2016	2006	2011	2016	2006	2011	2016
100- to 130-seat narrowbody	1,169	731	484	431	372	141	1,600	1,103	625
130- to 160-seat narrowbody	2,493	2,895	2,691	166	242	203	2,659	3,137	2,894
160- to 190-seat narrowbody	4,000	5,605	8,267	402	517	469	4,402	6,122	8,736
190+ seat narrowbody	1,184	1,415	1,947	50	92	242	1,234	1,507	2,189
<b>Total</b>	<b>8,846</b>	<b>10,646</b>	<b>13,389</b>	<b>1,049</b>	<b>1,223</b>	<b>1,055</b>	<b>9,895</b>	<b>11,869</b>	<b>14,444</b>

Source: Flightglobal Fleets Analyzer February 2016

assume a 1.5% rate of inflation.

The analysis provides CMVs, FBVs and lease rates for some of the most common aircraft and engine variant combinations, but it is not comprehensive. Other engine variants may be available for some aircraft types.

### 100- to 130-seat narrowbodies

The number of in-service and stored 100-to 130-seat narrowbodies declined from 1,600 in 2006 to 625 in 2016 (see table, this page). This is equivalent to a 61% fleet reduction. The proportion of the entire narrowbody fleet represented by 100-to 130-seat aircraft declined from 16.2% to 4.3% during this period.

The fleet of in-service and stored 100-to 130-seat aircraft includes 737-500s (230), 717-200s (155), 737-200s (104), 737-600s (57), A318s (49) and DC-9s (30).

Most types have reduced in numbers over the past 10 years. The exceptions are the 717-200, A318 and 737-600 fleets, which have remained fairly stable. There has been a particularly large fall in the number of active older types.

The A318 and 737-600 are the most modern models in this size category, although neither sold in large numbers.

The A318 is the only active aircraft in this category, with airframes aged eight years or younger. It typically has 107-132 seats, and there are 47 in service and two in storage. The age of these 49 aircraft ranges from six to 12 years. The A318 is powered by PW6000 or CFM56-5B series engines. The largest operators are Air France (18) and Avianca Brazil (15).

The 737-600 typically seats 110-130 passengers and is exclusively powered by CFM56-7B series engines. Only 69 were produced, and 56 remain in service, with one in storage. Age profile of the 737-600 fleet ranges from nine to 18 years.

The 737-500 is the predecessor to the 737-600, and also has 110-130 seats. The 737-500 is exclusively powered by CFM56-3 series engines. The age of the active and parked fleet is 16-26 years, but it still represents 35% of the in-service fleet of 100-to 130-seat narrowbodies.

The 717-200 typically has 106-117 seats. Only 155 were built, with 151 still

in service and a further four in storage.

These aircraft are concentrated between a small number of operators including Delta Air Lines (91), Qantas Link (20) Volotea (19) and Hawaiian Airlines (18).

The 717-200 is powered by Rolls-Royce BR715 engines. The fleet is aged from nine to 17 years old. From 2011 to 2016 about 17% of the 717-200 fleet was returned to active service, indicating a certain level of demand.

“We do not see a lot of demand for 100-to 130-seat narrowbodies,” explains Craig Papayanis, managing director at Aegis Aircraft LLC. “Higher fuel costs over the past 10 years reduced or eliminated what little demand there was. The marginal cost of flying the next larger size aircraft means that it rarely makes sense to operate smaller types. The exception might be where exceptional take-off performance is required.”

“The 100-to 130-seat sector has performed very poorly, probably because of high operating costs,” says Fitzgerald. “Any narrowbody that is shrunk to this size has a heavier-than-needed wing, which results in higher maintenance and landing charges. Larger regional jets have taken away the need to operate de-optimised aircraft on thinner routes.”

Demand has decreased for most 100-to 130-seat types, since their ASM economics have lagged behind larger narrowbodies. The one exception is the 717-200, that has seen increased demand from a small number of carriers including Delta Hawaiian, Qantas and Volotea.

“High demand for 717-200s has been driven by specific market needs and a shortage of supply,” says Fitzgerald. “In general, secondary values and lease rates for 100-to 130-seat narrowbodies have been badly hit by the lack of demand, although engines have retained decent values since some are re-usable on larger types.”

717-200s have seen some value stability as the current user base attempts to source additional aircraft.

Oriel estimates that the CMV for an eight-year-old A318 in half-life maintenance condition with half-life engines will vary from \$7.80 million for an aircraft with PW6122A engines to \$13.00 million for one with CFM56-

5B8/3 powerplants (see table, page 12).

For older vintage aircraft, Oriel estimates that the typical CMV for A318s will be \$4.80-12.00 million (see table, page 12). This compares to \$6.50-13.00 million for a 737-600, \$1.50-2.40 million for a 737-500, and \$9.00-9.20 million for a 717-200. Oriel estimates that monthly lease rates could be \$85,000-135,000 for a 737-600 and \$30,000-60,000 for a 737-500. The estimated lease rate for a 717-200 is \$130,000. No lease rate estimate was available for the A318.

None of the active 100-to 130-seat narrowbodies remain in production. Moreover, Airbus and Boeing have decided not to produce neo and MAX variants of the A318 and 737-600. The only aircraft in production that could be classified as a 100-to 130-seat narrowbody is the CS100, the smallest member of Bombardier’s C Series family. There are 48 CS100s on firm order.

Future demand could be met by large RJs or the CS100. Demand and values for existing 100-to 130-seat narrowbodies are likely to continue falling as more efficient aircraft enter service.

By 2020 the secondary 100- to 130-seat narrowbody market will be dominated by aircraft older than 12-13 years. No eight-year-old aircraft will be available. The first CS100 is due for delivery in 2016, so it is unlikely any of this type will be available on the secondary market until 2024.

Oriel estimates that FBVs for typical used 100- to 130-seat narrowbodies in 2020 could be \$0.60-1.00 million for a 737-500, \$4.40-5.25 million for a 717-200, \$0.10-7.10 million for an A318, and \$3.90-7.40 million for a 737-600.

### 130- to 160-seat narrowbodies

The in-service and stored 130- to 160-seat fleet increased by 9% from 2,659 aircraft in 2006 to 2,894 in 2016 (see table, this page). Despite this, the proportion of narrowbodies represented by 130- to 160-seat aircraft declined from 27% to 20% during this period.

The segment is dominated by the A319-100 and 737-700. The in-service and stored fleet includes 1,348 A319-100s, 1,073 737-700s, 435 737-300s, 21

## NARROWBODY AIRCRAFT USED VALUES BASED ON EIGHT-YEAR-OLD AIRCRAFT

Aircraft type	Engine	CMV-2106 (\$-m)	FBV-2020 (\$-m)	Lease rate - 2016 (\$-m)
<b>100- to 130-seat narrowbody</b>				
A318	CFM56-5B8/3	13.00	N/A	N/A
A318	PW6122A	7.80	N/A	N/A
<b>130- to 160-seat narrowbody</b>				
737-700	CFM56-7B22	14.85-15.50	15.35-16.00	0.155
737-700	CFM56-7B22/3	15.35-16.00	15.85-16.50	0.155
737-700	CFM56-7B22E	15.95-16.60	16.45-17.10	0.155
737-700	CFM56-7B24	15.95-16.60	16.45-17.10	0.155
737-700	CFM56-7B24E	16.95-17.60	17.45-18.10	0.155
A319	CFM56-5B5/P	14.00-14.50	15.10-15.60	0.155
A319	CFM56-5B5/3	14.65-15.15	15.10-15.75	0.155
A319	CFM56-5B6/P	14.70-15.20	15.80-16.30	0.155
A319	CFM56-5B6/3	15.35-15.85	16.45-16.95	0.155
A319	CFM56-5B7/3	16.10-16.60	16.20-16.70	0.155
A319	V2524-A5	14.50-15.00	15.60-16.10	0.155
A319	V2527M-A5	15.30-15.80	16.40-16.90	0.155
<b>160- to 190-seat narrowbody</b>				
737-800	CFM56-7B24	20.15-20.80	21.25-21.90	0.235
737-800	CFM56-7B24/3	20.65-21.30	21.75-22.40	0.235
737-800	CFM56-7B26	21.15-21.90	22.35-23.00	0.235
737-800	CFM56-7B26/3	21.75-22.40	22.85-23.50	0.235
737-800	CFM56-7B26E	22.25-22.90	23.35-24.00	0.235
737-800	CFM56-7B27	21.65-22.30	22.75-23.40	0.235
737-800	CFM56-7B27/3	22.15-22.80	23.25-23.90	0.235
737-800	CFM56-7B27E	22.65-23.30	23.75-24.40	0.235
A320-200	CFM56-5B4/P	19.60-20.10	20.95-21.45	0.215
A320-200	CFM56-5B4/3	20.30-20.80	21.65-22.15	0.215
A320-200	CFM56-5B6/P	18.40-18.90	19.85-20.35	0.215
A320-200	CFM56-5B6/3	21.35-21.85	22.70-23.20	0.215
A320-200	V2527-A5	19.60-20.10	20.95-21.45	0.215
A320-200	V2527E-A5	20.10-20.60	21.45-21.95	0.215
<b>190+ seat narrowbody</b>				
737-900ER	CFM56-7B26/3	25.75	25.70	0.235
737-900ER	CFM56-7B26E	26.25	26.20	0.235
A321-200	CFM56-6B3/P	23.20-23.80	23.40-24.00	0.240
A321-200	CFM56-5B3/3	23.90-24.50	24.10-24.70	0.240
A321-200	V2530-A5	22.70-23.30	22.90-23.50	0.240
A321-200	V2533-A5	23.15-23.75	23.45-24.05	0.240

Source: Oriel

Oriel current market values and future base values, assuming 1.5% inflation. All values are for aircraft in half-life maintenance condition with half-life engines.

MD-87s and 17 DC9-51s.

The in-service and stored fleets of A319-100s and 737-700s have increased over the past 10 years, while the number of 737-300s has reduced.

The A319-100 has 124-156 seats, and is powered by CFM56-5B or V2500 engines. The fleet ranges from brand new to 20-year-old aircraft. The largest fleets of A319-100s belong to easyJet (147), American Airlines (125) Delta Air Lines (57) and United Airlines (56). There are only 27 A319-100s in storage.

The 737-700 can seat 126-149 passengers, depending on configuration and is exclusively powered by CFM56-7B series engines. The fleet's age profile ranges new to 19-year-old aircraft. Southwest Airlines operates nearly half (477) of the active and stored 737-700 fleet. The next largest operator is WestJet (59). Only 30 737-700s are in storage.

In 2006 the 737-300 was the most

common 130- to 160-seat narrowbody. It still accounts for 15% of the in-service and stored fleet in this segment in 2016, although a quarter of these 737-300s are in storage. The 737-300 is the predecessor to the 737-700, and has the same capacity. It is exclusively powered by CFM56-3 series engines. The 737-300 fleet profile is 16-31 years, and the largest operator is Southwest Airlines (120).

"130- to 160-seat narrowbodies are less attractive," claims Papayanis. "In today's cost environment airlines are more profitable operating larger variants."

Demand has generally decreased in the 130- to 160-seat size category as carriers have opted for larger narrowbodies. Original equipment manufacturers (OEMs) may have discounted heavily to win orders in this size category, particularly to fend off the C Series. This will flow through to used

aircraft values and lease rates.

Oriel estimates that the CMV for a typical eight-year-old A319-100 could be \$14.00-16.60 million (*see table, this page*). This compares to a CMV of \$14.85-17.60 million for a similar vintage 737-700. Oriel estimates that the monthly lease rate for both types would be \$155,000. Fitzgerald believes lease rates could be as low as \$120,000-140,000 for an eight-year-old A319-100, and \$130,000 for a similar vintage 737-700.

For older vintage aircraft Oriel estimates that typical CMVs will be \$3.00-14.15 million for an A319-100, \$6.75-16.45 million for a 737-700 and \$1.00-3.25 million for a 737-300 (*see table, this page*). It estimates lease rates will be \$90,000-150,000 for an A319-100, \$100,000-150,000 for a 737-700 and \$30,000-70,000 for a 737-300.

There are at least 388 130- to 160-

seat narrowbodies on order, including A319neos (16), A319neos (48), 737-700s (74), 737 MAX 7s (60) and CS300s (190). It was not possible to identify the specific variant for all of the 737 MAX aircraft on order, so the actual order total for 737 MAX 7s may be higher. It is highly unlikely that any A319neos, 737 MAX 7s or CS300s will be available in the secondary market by the end of this decade. The used market will, therefore, continue to be dominated by A319-100ceos and 737-700s.

Demand continues to move to larger narrowbodies as airlines upgauge. It is likely, however, that there will continue to be a market segment that 100- to 130-seat narrowbodies can satisfy.

Not all airlines are turning away from this market. United Airlines recently announced an order for 25 737-700s in addition to a previously announced order for 40 of the aircraft. The airline plans to use them to replace 50-seat RJ services.

Values for 130- to 160-seat narrowbodies are likely to fall if OEMs offer discounts on new orders to prevent the CS300 from gaining traction.

Oriel estimates that FBVs for typical eight-year-old 130- to 160-seat narrowbodies will be \$15.10-16.95 million for an A319-100, and \$15.35-18.10 million for a 737-700 (see table, page 12) by 2020.

### 160- to 190-seat narrowbodies

The 160- to 190-seat segment saw the strongest growth in narrowbodies from 2006 to 2016. The number of in-service and stored 160- to 190-seat aircraft increased by 98%, from 4,402 to 8,736 during this period (see table, page 10). The portion of the narrowbody fleet represented by 160- to 190-seat aircraft also increased from 44% to 60%.

A320-200ceos and 737-800s account for 88% of the entire in-service and stored fleet of 160- to 190-seat aircraft. This fleet includes 737-800s (3,897), A320-200s (3,823), MD-80s (594), 737-400s (283), MD-90s (73), 737-900s (52), a few 727-200s and an A320neo.

The 737-800 and A320-200 fleets have continued to grow since 2006, while older types such as the 737-400 and MD-80 have seen their numbers decline.

The 737-800 accommodates 162-189 seats, depending on configuration, and is exclusively powered by CFM56-7B series engines. The age profile of in-service and stored aircraft varies from new to 18-year-old examples. The largest 737-800 fleets are operated by Ryanair (327), American Airlines (266) and United (130). There are 54 737-800s in storage.

The A320-200 seats 150-180 passengers and is powered by CFM56-5B or V2500 engines. The fleet's age profile

varies from new to 27-year-old aircraft. The largest A320-200 fleets are operated by jetBlue Airways (130), China Eastern Airlines (127) and China Southern Airlines (119). There are 96 A320-200s in storage.

The 737-400 is the largest member of the 737 classic family. It seats 147-168 passengers, and is powered by CFM56-3s. The youngest 737-400 is now 16 years old, and the oldest is 28 years. About 41% of the fleet is in storage.

The MD-80 fleet includes several variants. The MD-81, MD-82, MD-83 and MD-88 can seat 155-172 passengers. The remaining fleet is 16-34 years old. A large part of the fleet is operated by American Airlines and Delta Air Lines, while one-third is in storage. Only 116 MD-90s were produced, seating 158-172 passengers. Delta operates most of the remaining fleet, which is 15-22 years old.

The 737-900 seats 175-189 passengers, and is powered by CFM56-7B series engines. Only 52 737-900s were produced before it was superseded by the 737-900ER. These aircraft are now 10-15 years old, and all remain in service. The largest operators are Korean Air (16) and Alaska Airlines (12).

“Demand for 160- to 190-seat aircraft has increased significantly over the past 10 years,” says Fitzgerald. “OEMs have done a great job selling

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## OLDER VINTAGE NARROWBODY AIRCRAFT USED VALUES

Aircraft type	Engine	CMV-2106 (\$-M)	Lease rate - 2016 (\$-m)
<b>100- to 130-seat narrowbody</b>			
717-200	BR715A1-30	9.00	0.130
717-200	BR715C1-30	9.20	0.130
737-500	CFM56-3C1	1.50-2.40	0.030-0.060
737-600	CFM56-7B20	6.50-12.50	0.085-0.135
737-600	CFM56-7B22	7.00-13.00	0.085-0.135
A318	CFM56-5B8/P	10.00-12.00	N/A
A318	PW6122A	4.80-6.80	N/A
<b>130- to 160-seat narrowbody</b>			
737-300	CFM56-3B1	1.00-2.75	0.030-0.070
737-300	CFM56-3B2	1.25-3.00	0.030-0.070
737-300	CFM56-3C1	1.50-3.25	0.030-0.070
737-700	CFM56-7B20	6.75-13.75	0.100-0.150
737-700	CFM56-7B22	7.75-14.75	0.100-0.150
737-700	CFM56-7B24	8.35-15.35	0.100-0.150
737-700	CFM56-7B26	9.45-16.45	0.100-0.150
A319-100	CFM56-5A5	3.00-11.25	0.090-0.150
A319-100	CFM56-5B5/P	4.50-12.75	0.090-0.150
A319-100	CFM56-5B6/P	5.20-13.45	0.090-0.150
A319-100	CFM56-5B7/P	5.90-14.15	0.090-0.150
A319-100	V2522-A5	4.45-12.70	0.090-0.150
A319-100	V2524-A5	5.00-13.25	0.090-0.150
A319-100	V2527M-A5	5.80-14.05	0.090-0.150
<b>160- to 190-seat narrowbody</b>			
737-400	CFM56-3B2	2.75-4.25	0.045-0.090
737-400	CFM56-3C1	3.00-4.50	0.045-0.090
737-800	CFM56-7B24	11.40-19.20	0.155-0.225
737-800	CFM56-7B26	12.50-20.30	0.155-0.225
737-800	CFM56-7B26/3	13.00-20.80	0.155-0.225
737-800	CFM56-7B27	12.90-20.70	0.155-0.225
737-900	CFM56-7B24	12.90-13.70	0.180
737-900	CFM56-7B26	14.00-14.80	0.180
A320-200	CFM56-5A1	2.00-5.50	0.045-0.110
A320-200	CFM56-5A3	2.10-5.60	0.045-0.110
A320-200	CFM56-5B4/2P	6.10-17.30	0.105-0.205
A320-200	CFM56-5B4/P	6.60-17.80	0.105-0.205
A320-200	CFM56-5B6/P	5.65-16.85	0.105-0.205
A320-200	V2500-A1	0.75-4.25	0.045-0.110
A320-200	V2527-A5	7.25-18.45	0.105-0.205
A320-200	V2527E-A5	7.10-18.30	0.105-0.205
MD-82	JT8D-217C	0.50-1.00	N/A
MD-83	JT8D-219	0.50-1.00	N/A
MD-88	JT8D-219	0.50-1.00	N/A
MD-90-30	V2525-D5	5.00	0.080
MD-90-30	V2528-D5	5.00	0.080
<b>190+ seat narrowbody</b>			
737-900ER	CFM56-7B26/3	24.00-24.75	0.215-0.225
757-200	PW2037	23.55-23.80	0.050-0.195
757-200	RB211-535E4	3.50-16.00	0.050-0.195
757-200	RB211-535E4-B	4.00-16.50	0.050-0.195
757-300	PW2040	14.00-19.50	0.140-0.200
757-300	RB211-535E4-B	14.50-20.00	0.140-0.200
757-300	RB211-535E4-C	14.75-20.25	0.140-0.200
A321-100	CFM56-5B1	7.00-7.75	0.100-0.130
A321-100	CFM56-5B2	7.30-10.05	0.100-0.130
A321-100	V2530-A5	7.00-7.75	0.100-0.130
A321-200	CFM56-5B3/P	8.80-21.40	0.150-0.225
A321-200	V2533-A5	9.50-22.10	0.150-0.225

Source: Oriel

1). Oriel current market values and future base values, assuming 1.5% inflation. All values are for aircraft in half-life maintenance condition with half-life engines.

2). Older vintage accounts for all aircraft over eight years of age.

these aircraft to airlines and investors. The financing community, including lessors, has done a great job raising cheap financing, and this seat count is now considered by many to be optimal for

airline operations.”

The A320-200 and 737-800 are in high demand. Evidence suggests lessors have been paying up for these aircraft and/or offering lower lease rates as sale-

leaseback transactions become increasingly competitive.

“Older 737-800s are more sought after than older A320s,” claims Papayanis. It seems A320s get parted out as they approach the 20-year mark, perhaps because of higher maintenance requirements. 737s seem to remain desirable until they reach 25-years plus.

“Demand for MD-80s is almost non-existent, and has been for years,” adds Papayanis. “737-400s remain in strong demand. We wish we had 20 more to lease out. Demand has not abated for this aircraft over the past 10 years.”

Oriel estimates that the CMV for a typical eight-year-old A320-200 could be \$18.40-21.85 million (see table, this page), compared to a CMV of \$20.15-23.30 million for a similar vintage 737-800. Oriel estimates that monthly lease rates would be \$215,000 for the A320-200, and \$235,000 for the 737-800.

For older vintage aircraft Oriel puts typical CMVs at \$0.75-18.45 million for an A320-200, \$11.40-20.80 million for a 737-800, and \$12.90-14.80 million for a 737-900 (see table, this page). Values for 737-400s and MD-80s are estimated at \$2.75-4.50 million and \$0.50-1.00 million. The estimated value of a used MD-90 is \$5.00 million. Lease rates for these older aircraft are \$45,000-205,000 for an A320-200, \$155,000-225,000 for a 737-800 and \$180,000 for a 737-900. Lease rates will be \$45,000-90,000 for a 737-400, and \$80,000 for an MD-90.

At least 6,800 160- to 190-seat narrowbodies are on order: A320neos (591), A320neos (3,338), 737-800s (1,058) and 737 MAX 8s (1,843). Actual order numbers for 737 MAX 8s may be higher, as it was not possible to identify the specific variant for some orders.

Aircraft in the 160- to 190-seat size range will continue to represent the bulk of the narrowbody market.

“We expect values for the existing A320ceo and 737-800 models to fall significantly from currently inflated numbers,” says Papayanis. “We also expect ageing 737s to be more valuable than similar vintage A320s.”

Some believe that the passenger-to-freighter conversion programmes being developed for the A320 and 737-800 could have a positive impact on used aircraft values. “Successful A320 and 737-800 freighter programmes would lead to a need for feedstock aircraft,” says Korn, “so there would be less supply to meet demand for used passenger aircraft. This would be good for used values.”

Oriel estimates that FBVs for typical eight-year-old 160- to 190-seat narrowbodies will be \$19.85-23.20 million for an A320-200 and \$21.25-24.40 million for a 737-800 by 2020 (see table, this page).

## 190+ seat narrowbodies

The in-service and stored fleet of 190+ seat narrowbodies grew from 1,234 aircraft in 2006 to 2,189 in 2016, equivalent to a 77% increase. The 190+ seat segment accounts for 15% of the active narrowbody fleet in 2016, up from 12% in 2006.

A321s account for more than half of the in-service and stored fleet of 190+ seat narrowbodies, including A321-200s (1,134), 757-200s (572), 737-900ERs (366) A321-100s (62) and 757-300s (55).

A321-200s and 737-900ERs have had the strongest fleet growth over the past 10 years, while the number of A321-100s and 757s has been in decline.

The A321 is powered by CFM56-5B or V2500 series engines and seats 185-220 passengers. There are two main sub-variants: early A321-100 models and later A321-200s, which have higher weight specification options. The A321-100 fleet is 14-22 years old. The age profile of the A321-200 fleet varies from new to 19-year-old units.

The largest operators of active and stored A321-100s are Lufthansa (20) and Alitalia (13). The largest operators of A321-200s are American Airlines (176), China Southern (79) and Turkish Airlines (56). There are only six A321-100s and 25 A321-200s in storage.

The 737-900ER superseded the 737-900. It has the same fuselage dimensions but superior range and additional exit doors that increase its maximum capacity. The 737-900ER is powered by CFM56-7B series engines and accommodates 178-220 seats. The largest operators are United (129), Lion Air (71) and Delta (52). The age profile of the 737-900ER fleet ranges from new to nine-year-old aircraft. Only two aircraft are in storage.

The 757 family includes two main variants: the 757-200 and 757-300. These are powered by RB211-535 or PW2000 series engines. The 757-200 seats 194-228 passengers, while the stretched 757-300 seats 243-280. The age profile of the 757-200 fleet is 11-31 years. The 757-300 fleet is 11-17 years old. The largest in-service and stored 757-200 fleets are operated by Delta (166), American (104) and United (66). There are 209 stored 757-200s. Only 55 757-300s were produced, all of which remain in service with the majority operated by United (21), Delta (16) and Condor (13).

"Demand has improved for 190+ seat narrowbodies, but not to the same extent as the A320s and 737-800s," says Fitzgerald.

757s are being retired in large numbers as the type ages but some airlines have continued to operate them, since there is no current replacement for certain routes, such as those between Europe and the US Northeast. Airbus has

## NARROWBODY AIRCRAFT ENGINE VALUES - HALF-LIFE CONDITION

Engine	Aircraft	1Q2016 Market value (\$-m)
<b>Mature</b>		
BR715C1-30	717-200	4.08
CFM56-3B1	737-300/-500	0.56
CFM56-3B2	737-300/-400	0.65
CFM56-3C1	737-300/-400/-500	0.84
CFM56-5A1	A320-200	1.48
CFM56-5A3	A320-200	1.66
CFM56-5A5	A319-100	1.27
JT8D-217A	MD-82/-83	0.34
JT8D-217C	MD-81/-82/-83/-87/-88	0.49
JT8D-219	MD-82/-83/-87/-88	0.57
PW2037	757-200	2.50
PW2040	757-200	2.60
RB211-535E4	757-200	2.48
RB211-535E4-B	757-200/-300	2.67
V2500-A1	A320-200	1.18
V2525-D5	MD-90	3.44
V2528-D5	MD-90	3.63
<b>Current generation</b>		
CFM56-5B3/P	A321-200	7.19
CFM56-5B4/P	A320-200	6.14
CFM56-5B5/P	A319-100	4.74
CFM56-5B6/P	A319-100/A320-200	5.16
CFM56-5B7/P	A319-100	6.14
CFM56-7B20	737-600/-700	4.73
CFM56-7B22	737-600/-700	5.37
CFM56-7B24	737-700/-800/-900	5.91
CFM56-7B26	737-700/-800/-900/-900ER	6.70
CFM56-7B26/3	737-700/-800/-900ER	7.19
CFM56-7B27	737-800	6.92
V2522-A5	A319-100	4.05
V2524-A5	A319-100	4.47
V2527-A5	A320-200	5.23
V2527E-A5	A320-200	5.56
V2530-A5	A321-100/-200	5.81
V2533-A5	A321-200	6.18

Source: Avitas - summary of engine values in half-life maintenance condition as of 1st quarter 2016

seen a big increase in demand for the A321 as carriers continue to upgauge narrowbody fleets. Boeing has not had the same success with the 737-900ER. Orders for A321ceo and neos have outpaced those for the 737-900ER and 737 MAX 9.

"The youngest and, therefore, most attractive 757-200s have been highly sought after in the passenger market," claims Fitzgerald.

"The 757 is mainly attractive as a freighter," says Papayanis. "We do not see much demand in the secondary airline market. Older A321s are relatively short-range aircraft when configured for mainline service. We do not expect much demand for them from the secondary airline market, since their payload-range performance is weak when configured with customary higher density seating."

Oriel estimates the CMV for a typical eight-year-old A321-200 at \$22.70-24.50 million (see table, page 14), compared to

a CMV of \$25.75-26.25 million for a similar vintage 737-900ER. Oriel estimates that monthly lease rates would be \$240,000 for the A321-200, and \$235,000 for the 737-900ER.

For older vintage aircraft, Oriel estimates that typical CMVs will be \$8.80-22.10 million for an A321-200, \$7.00-10.05 million for an A321-100, and \$24.00-24.75 million for a 737-900ER (see table, page 14).

Values for 757-200s and 757-300s are estimated to be \$3.50-23.80 million and \$14.00-20.25 million. Lease rates for these older aircraft will be \$150,000-225,000 for an A321-200, \$100,000-130,000 for an A321-100, and \$215,000-225,000 for a 737-900ER. Lease rates will be \$50,000-195,000 for a 757-200, and \$140,000-200,000 for a 757-300.

At least 1,989 190+ seat narrowbodies are on order. This includes A321ceos (410), A321neos (1,114), 737-900ERs (142), 737 MAX 9s (223) and



737 MAX 200s (100). The actual order numbers for 737 MAX 9s may be higher, since it was not possible to identify the specific variant for some MAX orders.

Demand for the A321 continues to outpace that for the 737-900ER. There has also been more demand for the A321neo than the 737 MAX 9. Values in the 190+ seat category could suffer if Boeing tries to reverse the trend in orders in favour of the A321neo by discounting the 737 MAX 9.

Oriel estimates that FBVs for typical eight-year-old 190+ seat narrowbodies will be \$22.90-24.70 million for an A321-200, compared to \$25.70-26.20 million for a 737-900ER (see table, page 14) by 2020.

## Narrowbody engines

“Spare engines are expensive assets,” says Friis-Petersen. “Airlines are trying to reduce the amount of spares they hold to ease their balance sheets, at the same time as needing access to spare engines to guarantee continued operations and save costs during a shop visit, either scheduled or unscheduled. These basic demands will continue, but there are major differences and according to engine generations.”

*Aircraft Commerce* has sub-categorised the most numerous narrowbody engine variants into mature and current generation types.

Mature engines include the CFM56-3 series that powers the 737-300, -400 and -500; the V2500-A1 series that powers the A320-200; and the RB211-535 and PW2000 families that power the 757-200 and -300. Other mature engines include the V2500-D5 series, BR715 family, and

JT8D-200 series, that power the MD-90, 717-200 and MD-80.

Current generation engines include the CFM56-7B series that powers the 737NG family, and the CFM56-5B and V2500-A5 series that power the A320ceo family of aircraft.

## Mature engines

“Mature engines are characterised by a decreasing active fleet and growing surplus, in serviceable or unserviceable condition,” explains Friis-Petersen. “This would normally drive values down but they are being held up by a growing demand for half-life engines as a cost-effective alternative to replacing powerplants that are due for overhaul, either as exchange or lease engines. The increasing popularity of such ‘instant power solutions’ over the past few years, means that these engines can become scarce, and experience strong demand and higher-than-expected pricing. Demand and values for mature assets can be very volatile, however, and will strongly correlate with the number of engine retirements within a set period.”

CMVs have been summarised for some of the most numerous mature narrowbody engine variants in half-life condition (see table, page 15). According to Avitas values range from \$340,000 for a JT8D-217A, to \$4.08 million for a BR715C1-30.

The V2500-A1 has seen limited demand over the past 10 years with lease rates for this variant trending down. WLFC says that there has been a decline in demand and values for CFM56-3, RB211-535, PW2000, JT8D-200 and

*The trend towards higher capacity narrowbodies has seen an increase in the fleet of 190 plus seat aircraft over the past 10 years. A321s are the most popular type in this category, and have outsold Boeing’s 737-900ER. 757-200s are now starting to retire in large numbers.*

BR715 family engines, emphasising that this is a general observation since it does not have recent experience with these engine variants.

## Current generation engines

“Demand for leasing and related values remains strong as long as engines remain in production, since both the active fleet and the number of shop visits continues to grow,” claims Friis-Petersen.

CMVs have been given for some of the most numerous current generation narrowbody engine variants in service with eight-year old aircraft (see table, page 15). According to Avitas, half-life values are \$4.73-7.19 million for CFM56-7Bs, \$1.27-7.19 million for CFM56-5Bs, and \$4.05-6.18 million for V2500-A5 variants.

WLFC has observed steady demand, but a trend for declining lease rates for these engine types over the past 10 years.

“We anticipate values and demand for CFM56-7B, CFM56-5B and V2500-A5 engine types will be relatively steady for the rest of this decade,” says Welsh.

“With many more players in the engine leasing space, however, this drives the supply and lease rate side of the equation.

“Aircraft part-outs also affect engine supply and lease rates,” continues Welsh. “These are forecast to rise, with the number of aircraft being retired set to hit record numbers over the next decade. Green-time engines hitting the market can cause irrational pricing pressure, but they can fail to meet airlines’ standards due to records issues or hardware condition.”

The introduction of new-generation engines with the A320neo and 737 MAX families will affect current generation engine values, but not before 2020.

“As production rates increase and the aggregate population of the A320neo and 737 MAX fleets grows, demand for, and values of, current technology aircraft engines will start to be affected,” says Welsh. “We do not expect the market to hit that threshold before 2020. We believe demand and values will be directly affected by the aircraft retirement cycle and part-out rates for the A320ceo and 737NG.” [AC](#)

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