

2016 and 2017 have been a quiet period for widebody orders, although a sizeable backlog exists, while order announcements for the next generation of narrowbodies have been frequent. The current market stance on 200-400 seat widebody aircraft is summarised.

# Assessment of the 200- to 400-seat widebody market

A widebody or twin-aisle aircraft has a wide, high-capacity passenger cabin and is able to operate intercontinental and long-haul routes. The cabin layout of such aircraft varies extensively between operators, with two, three or four cabin classes, divided between First, Business, Premium Economy and Economy. Widebody seating configurations in economy class are seven to 10 seats abreast, depending on fuselage interior width. Since economy class is more densely packed, it will have a larger number of narrower seats abreast.

The 200-400 seat widebody fleet and market is analysed, exploring options for in-production and in-development aircraft, including: the A330ceo (current engine option), which comprises the A330-200, and -300 series; the emerging A330neo (new engine option) which will comprise the A330-800 and -900 series; and the A350XWB family, which comprises the in-service A350-900, and will be joined by the -1000.

The 787 in-service fleet is the 787-8 and -9 series, while the 787-10 is soon to enter into service (EIS). Last, the 777-X family is some years away from EIS, and will comprise the 777-8X and -9X. Where appropriate, examples are given of the changing route networks that come with the introduction of a new type. Given the pending certification of some of these types and series, not all performance information is available.

Boeing forecasts that more than 5,000 small widebodies (200-300 seats) will be delivered over the next 20 years, in addition to almost 3,200 medium and large widebodies (over 300 seats) in operation. The 787 and A330 families are the two choices in the most popular 200-

300 seat segment, while the 777 and A350 fit into the medium/large widebody category.

According to AVITAS, about 90% of outstanding widebody orders fall into the 300-seat category, while in-service aircraft in this segment account for only 60% of passenger- and freighter-configured widebodies.

AVITAS explains that myriad factors affect the demand for new-generation aircraft. While performance, range and capacity influence fleet planners when planning aircraft orders, the appetite for replacing legacy fleets with next-generation types will depend more on economic fluctuations, such as fuel prices. "From 2004 to 2014 fuel prices rose from \$40 to over \$100 a barrel, which increased the appeal of more fuel-efficient options for carriers," says Doug Kelly, senior vice president asset valuation at AVITAS, Inc. "This period coincided with industry events, such as the introduction of the 787, and the launch of the A350 programme. In addition, airlines were going through the 767's replacement cycle, so orders were necessary. 2005 and 2007 saw large volumes of orders placed; more than 1,000 widebody orders were placed in 2007 alone." Kelly adds that the decrease in fuel prices since 2014 has slowed the rate of orders placed, but left original equipment manufacturers (OEMs) with record order backlogs. "The question is, has the industry anticipated more growth than there will be, and if so will too many widebodies be delivered?" asks Kelly. "Most of the new growth in widebodies has been in the Asia Pacific and Middle East. The Asia Pacific is undergoing significant and sustained growth in traffic that reflects economic activity in the region. The

concern is over-ordering in the Middle East. Looking at the widebody market of 350 seats and above (777, A350-1000 and A380), and combining aircraft in service and on order, the Middle East carriers have almost 50% of the total.

"With oil prices dropping since 2014 to \$40-60 per barrel, the demand for new widebodies in the Middle East has slowed considerably," says Kelly. "There is growing concern whether the past strong traffic growth can be sustained to support the order backlog for these large aircraft. The general consensus, however, is that North American carriers may have under-ordered in this segment, which may help to reverse any future downward trend."

Leasing demand is strong for the A330 and 787, according to Kelly. "While larger aircraft, such as the 777 and A350 are mainly leased through Aercap or GECAS, lessors prefer smaller widebodies such as the 787 and A330," explains Kelly. "The fact that widebodies have a smaller operator base than narrowbodies carries an element of market risk, however. The 777-300ER is facing some leasing challenges, for example, due to its age and operator base. Lessors are investigating whether current operators are open to extending leases, rather than re-transitioning or in the worst case retaining them. Of course, lease extensions are still finite, and the cost can be high."

## Widebody fleet size

IBA is an aviation consultancy firm offering fleet selection, market analysis, valuations and asset and cost management services. Its new data platform IBA.iQ provides figures for all commercial aircraft, including 200-400-





Latest Airbus figures show that there are 534 orders on backlog for the A350-900. The -1000 is due to enter commercial service in the last quarter of 2017, and there are more than 210 orders in the pipeline for the series.

seat widebodies. IBA says that the traditional large widebody markets are Europe, Asia Pacific, the Middle East and North America, with an approximate fleet size of installed units and order backlog as follows: the A330-200 has 610 aircraft in service and on order; the A330-300 fleet comprises 760 aircraft in service and on order; and the A330neo family has 210 firm aircraft orders.

For the 787 family, the in-service 787-8 and -9 have combined delivery and order totals of 475 and 653. The -10, pending EIS, has 150 firm orders. Of the A350 family, the -800 and -900 series total 650 aircraft, and the -1000 has 205 firm orders. Last, the 777-8X has 53 firm orders, while the 777-9X has 275.

The above figures therefore suggest about 4,040 current and new generation aircraft in service and orders pending. “In addition, there are about an additional 2,400 older generation widebodies still in service, and if you add the remaining backlogs for 777-300ERs and A380s, this increases to about 2,630,” says Owen Geach, chief commercial officer at IBA.

Older generation widebodies include ageing aircraft, most of which are no longer in production, including: the A300-600 and A310 (54 passenger aircraft in service according to IBA); the A340-200 and -300 (110 left in service) and the A340-500 and -600 (about 70 still in service).

Of the 747 fleet, 160 747-400s are still flying, and 40 747-8s are in service and on order. There is also an active 767 and legacy 777 fleet in operation, including about 500 767-200/ERs, -300/ERs and -400ERs; and almost 1,400 777-200/ER/LRs and -300/ERs in-service. The -300ER is also still in production for a remaining order backlog.

According to IBA, the installed/order backlog fleet (as of June 2017) represents 61-63% of the total widebody passenger market. This is mostly due to a substantial backlog of historical orders, rather than new activity in the past year.

It is worth noting that the new-generation narrowbodies, such as the A320neo and 737MAX families are attracting the interest of traditional, long-haul carriers. These aircraft are flying further and displaying significant efficiency gains and cost-saving potential. The A321LR can fly some transatlantic sectors, and has been considered by Norwegian for its transatlantic fleet via an order for 30, and also by Aer Lingus. While typical load factors would feature in any fleet-planning decision, the increasing capabilities of single-aisle aircraft should be considered.

For example, Boeing has recently received an order from Qatar Airways, building on its existing fleet of 84 787s and 777s. This has increased Qatar Airways’ firm order backlog of Boeing twin-aisles from 65 to 105, including 60 777Xs (Boeing.com). Qatar Airways has also signed a letter of intent for up to 60 737 MAX 8s, making this the first Boeing single-aisle commercial model to join its fleet in more than 15 years.

## Performance & configurations

*Aircraft Commerce* defines Premium Economy as a separate class to Economy only if seat-abreast configurations are altered as well as leg room.

Operating performance, in addition to an exploration of the full widebody fleet, has previously been summarised for many of the in-service aircraft (*see Fuel burn & operating performance of the 787-8, 787-*

*9 and A350-900, Aircraft Commerce, October/November 2016, page 15; and Development of the widebody fleet in 2015, Aircraft Commerce, June /July 2016, page 6*). Some of the figures used in the specification tables overleaf have been extrapolated from these articles (*see table, page 30*). It should be noted that payload data depends heavily on airline configuration, and that most 777-X data has yet to be released.

## Orders & deliveries

As explained, some legacy requirements remain on the order book, in addition to the next-generation aircraft in development. “The oldest types here, the A330-200 and A330-300 have actually done very well,” says Geach. Over the past 10 years, the A330-200 has had 343 gross orders, and the A330-300 has had 512. “Admittedly over the past two years demand has been shifting away from A330-200s and -300s, although that is to be expected given that these are quite mature programmes,” adds Geach.

“While the 787-8 has had nearly 300 orders over the past 10 years, orders were strong earlier on in the programme, just as they were for the 787-9,” adds Jonathan McDonald, ISTAT senior certified appraiser at IBA. “While orders remain strong for the 787-9, they are only trickling in now for the 787-8. After a strong start in 2013 for the 787-10, orders slowed a little.”

Meanwhile, the A350-900 had a very strong order history in 2007 and 2008. “It also had a good year in 2013, but orders slowed a little again,” adds Geach. “Orders for the A350-1000 seem to have come in spikes, while the 777X got off to a good start in 2013 and 2014, although

## HISTORICAL DELIVERIES 200-400 SEAT WIDEBODIES - 2006 ONWARDS

	A330-200	A330-300	787-8	787-9	787-10	A350-900	TOTAL
2006	39	23	0	0	0	0	62
2007	42	26	0	0	0	0	68
2008	49	23	0	0	0	0	72
2009	38	38	0	0	0	0	76
2010	32	50	0	0	0	0	82
2011	40	43	3	0	0	0	86
2012	37	56	46	0	0	0	139
2013	43	57	65	0	0	0	165
2014	28	75	104	10	0	0	217
2015	30	70	71	64	0	14	249
2016	21	42	35	102	0	61	261

Source: IBAQ.

things seem to also have slowed since.” There was substantial demand for new aircraft orders in 2007, and a resurgence in 2013 and 2014 (see table, page 26).

IBA confirms that deliveries have risen year-on-year. “It is clear that production levels for the A330-200 and 300 are slowing, just as they are for the 787-8,” continues McDonald. “It is also clear that production levels for the A350-900 and 787-9 have been ramped up, and that these two products are likely to form a strong focus of the demand in terms of deliveries (see table, page 24).”

## Route developments

The introduction of the 787 led to the creation of many new route networks (see image, page 27). While the -8 has been behind most new 787 routes to date, the -9 is now becoming the focus of such announcements. These will be detailed later.

IBA has summarised key route introductions since the EIS of each subject aircraft. The configurations used on these routes will vary by operator.

Since its EIS, the 787-8 has flown on Beijing to San Jose (Hainan Airlines), Delhi to Birmingham (Air India), and Chicago to Barcelona (American Airlines). According to Seat Guru, Hainan Airlines’ 787-8 has 36 business-class seats 2-2-2 abreast, and 177 economy seats in a 3-3-3 layout, Air India’s has 18 business-class seats in 2-2-2 and 238 economy seats in 3-3-3, while American Airlines’ has 28 business-class (1-2-1) and 198 economy seats (3-3-3).

For the 787-9, Toronto to Santiago (Air Canada), Paris to Atlanta (Air France from October 2017), and Auckland to Tokyo (Air New Zealand) are now popular and future routes. Air Canada has 30 seats in business class (1-2-1), 21 in premium economy (2-3-2) and 247 in economy (3-3-3). According to

Seat Guru, Air France’s -9 has 30 seats in business class (1-2-1), 21 in premium economy (2-3-2) and 225 in economy (3-3-3).

Meanwhile, the 777-300ER has enabled the opening of routes such as Los Angeles to Sydney (American Airlines), San Francisco to Hong Kong (United Airlines), Taiwan to Vienna (EVA AIR), and Beijing to Frankfurt (Air China).

The A330-200 brought additional routes to the network, such as Detroit to Amsterdam (Delta Air Lines), Milan to New York (Alitalia) and Philadelphia to Athens (American Airlines). Delta’s A330-200 cabin layout comprises 34 business-class (1-2-1), and 200 economy (2-4-2) seats, while Alitalia’s comprises 20 business-class (1-2-1), 12 premium economy (2-3-2) and 219 economy (2-4-2) seats. The A330-300’s key long-haul routes include Atlanta to Amsterdam (Delta Airlines), and Stockholm to Los Angeles (Scandinavian Airlines). SAS’s cabin layout provides 32 business-class seats (1-2-1), 56 ‘SAS Plus’ (2-3-2) and 174 economy (2-4-2) seats. Last, the A350-900’s route network includes Singapore to Manchester (Singapore Airlines), Hanoi to Paris (Vietnam Airlines) and Sao Paulo to Madrid (LATAM Brasil). Singapore’s A350-900 layout contains 42 seats in business class (1-2-1), 24 in premium economy (2-4-2) and 187 in economy (3-3-3). Meanwhile LATAM Brasil’s -900 has a two-class layout comprising 30 Premium Business (2-2-2) and 318 economy seats (3-3-3).

## Market future

Over the next 10 years there will be a surge in fleet replacement and refreshment, driven by the deliveries of currently in-development aircraft. “Based on pure fleet numbers, it will be growth in simple terms,” says McDonald. “The remaining (and nominal) A300/767-200

fleets will bow out. The remaining active A340-200/300 fleets are now effectively down to half the number built, and if any are left in 10 years’ time, it will be a nominal fleet. Although it was only a small fleet from the outset, most A340-600s are still flying, despite high storage figures. By 2025, only a small number (if any) of A340-600s will remain.”

“Moving on to the A380, at the moment a part-out is unthinkable but the landscape could be a little different by 2027. It is quite difficult to predict what the A380 fleet will look like then, though we think it will be larger than it is today. In other words, if there have been any part-outs by 2027, the number will be less than the number of new deliveries over the same period” says Geach.

“By 2027 we anticipate that just about the entire 747-400 passenger fleet will have retired,” adds Geach. “If any are left in passenger service, the number will be minimal. As for the 747-8 fleet, as long as Lufthansa, Air China and Korean fleet plans still include this aircraft in 2027, there should not be any fleet reductions.”

It is likely that the 767-200/-200ER will also have been entirely phased out in 10 years, as well as the 767-300. Given the remaining production demand for the 767-300ER, these will still be in operation, although in vastly reduced numbers. “If the 777-300ER fleet peaks at about 950 aircraft (circa 2021), then it would not be surprising to see the odd part-out of the 777-300ER by 2022 or thereabouts,” adds Geach. “We suspect that even if from 2022 to 2027 the rate of retirements increases, however, most of those 950 aircraft will still be in service. As for the 767-400ER, this all depends on fleet planning at Delta and United.”

Although there are still nearly 500 active 777-200s, -200ERs and -200LRs today, there will be a large reduction in the fleet size over the next decade. It is

## HISTORICAL NET ORDERS 200-400 SEAT WIDEBODIES - 2006 ONWARDS

	A330-200	A330-300	A330neo	787-8	787-9	787-10	A350-900	A350-1000	777X	Total
2006	65	17	0	65	34		0	0	0	181
2007	75	63	0	133	136		271	57	0	735
2008	59	68	0	15	44		117	31	0	334
2009	29	46	0	21	3		22	0	0	121
2010	23	75	0	3	8		45	61	0	215
2011	12	43	0	6	33		19	0	0	113
2012	12	54	0	8	30		0	0	0	104
2013	12	62	0	31	35	128	140	65	66	539
2014	30	7	95	1	49	0	55	0	220	457
2015	14	43	41	10	26	21	2	0	20	177
2016	12	34	25	5	65	0	26	8	0	175
<b>Totals</b>	<b>343</b>	<b>512</b>	<b>161</b>	<b>298</b>	<b>463</b>	<b>149</b>	<b>697</b>	<b>222</b>	<b>306</b>	

Source: IBA.

likely that some will remain in operation.

As for the A330-200 and -300 fleets, IBA believes that while these will dwindle during the next decade, a significant proportion will still be going strong.

Naturally, it is unlikely that any of the newer generations of aircraft will be retired over the next 10 years, including the 787, A350 and A330neo families. The 777-8X/-9X fleets will simply have grown, and will be too young for any consideration in part-out.

In summary, the number of retiring and ageing 747-400s, older 767s, older A310/A300/A340s and 777s being retired from 2016 to 2027 will be far smaller than the number of newly delivered A330neos, 787s, A350s and 777-Xs. Add this to the remaining serviceable 777-200/300 series, the incumbent 787/A350 and A330ceo fleets, and it is clear that the fleet will grow.

Kelly at AVITAS foresees fuel prices remaining low in the near future, which will slow aircraft replacements, although increasing activity in the Asia Pacific region and China could lead to more orders being placed.

## In-production aircraft

### A330ceo

The A330ceo family comprises the A330-200 and -300 series. In service for 19 and 23 years respectively, the -200 and -300 have amassed over 1,400 orders across more than 120 operators. As of July 2017 over 1,300 A330ceos remain in service and in production.

The A330-300 was the first series to enter service in 1994, followed by the A330-200 in 1998. Airbus offers several weight variants for each series: almost 30 for the -200 and nearly 40 for the -300.

These offer multiple payload/range capabilities for passenger and freighter variants of the A330ceo family (see table, page 30).

According to Global Fleets Analyzer, there are 101 passenger-configured A330-200s and -300s on order. Of these, 22 are for the -200, comprising orders from Hawaiian Airlines (1), Iberia (2), Hi Fly (2), Iran Air (8), Jet Airways (5), Tianjin Airlines (1) and three unidentified customers. The -300 accounts for the remaining 79 orders, split between 12 operators: Aer Lingus (1), Air China (3), China Aviation Supplies (22), China Eastern (12), China Southern (4), Egyptair (1), EVA Air (1), Hong Kong Airlines (14), Lucky Air (2), Malindo Air (3), Saudia (5), and 12 orders for unannounced customers (July 2017).

The A330ceo production rate is currently six a month, for a backlog of just over 120 aircraft. Moreover, if the A330neo is included, the total for the whole A330 Family is more than 330 aircraft, including freighter- and military-configured A330s on order. Airbus advises that A330ceo production activity will gradually complement the A330neo's EIS, as the new build rate ramps up. Given the A330ceo's military and freighter applications, Airbus has no fixed end date for -200 and -300 production.

Jet Airways launched three new routes using its -200 and -300 fleet this year. In January, it announced the replacement of its 737-800 and a reduction in frequency of its Mumbai-Kuwait City sector; operating a daily frequency using the -200 and -300. In addition, it began flying on Mumbai-Chennai and Mumbai-Bangalore.

Air Canada also introduced a mixture of permanent and seasonal routes using a tri-class configured -300. Starting in February and March this year, permanent

routes include: Montreal to Brussels, Geneva, Frankfurt, Rome and Heathrow; and Toronto to Zurich, Copenhagen and Amsterdam.

AVITAS advises that 53% of the A330ceo's routes in the global network are shorter than 2,000nm. "The shortest recorded route is 50nm, which is operated by Lufthansa from Dathina Airport, Yemen (DAH) to Damman in Saudi Arabia," explains Kelly. "The longest is Buenos Aires (EZE) to Rome Fiumicino Airport (FCO), which is about 6,500nm and operated by Aerolineas Argentinas on the -200."

### A330-200

The largest A330-200 fleets are operated by Air China and China Eastern, each of which has 30. Air China has two cabin configurations in its -200 fleet. According to Seat Guru, one has 30 seats in business class (2-2-2) and 207 in economy (2-4-2), while the other has 12 in business class and 272 in economy. China Eastern has three versions in its -200 fleet: version one comprises 30 business-class and 202 economy seats; version two 30 business-class and 204 economy seats; and version three 24 business-class and 240 economy seats.

"The demand for new -200 aircraft has been falling, and there is some softness in the used sector," says McDonald. "For example, as of June 2017 there are about 25 available for sale/ACMI lease/general lease." IBA also says there are about 45 parked A330-200s, which is a significant figure in the worldwide market for this sector. Geach explains that this parked figure is not accounted for by just one operator/engine combination, but by aircraft fitted with Rolls, Pratt or GE engines. "Of 28 newly delivered aircraft since January 2016,

Since EIS, the 787 family operators have implemented 150 new routes. Norwegian, Saudi Arabian Airlines and KLM each have new routes shortly to be implemented (Boeing).

Iberia has taken 11, with most of the rest going to Aerolineas Argentinas, Beijing Capital Airlines, MEA Middle East Airlines, Rwandair, Sichuan, Tianjin and Tibet Airlines,” he adds. Total -200 orders to date are for 610 aircraft.

## A330-300

The -300 has three operators with substantial fleets: Turkish Airlines (37), Cathay Pacific (38) and Cathay Dragon (23). Seat Guru provides cabin layouts for the Turkish A330-300 of 28 business-class seats (2-2-2) and 261 economy seats (2-4-2). Cathay Pacific offers three versions of the -300 according to Seat Guru: two in a two-class layout while one version adds premium economy to the cabin layout via 2-3-2-abreast seating.

IBA says that there is more demand for new -300 aircraft than for the -200, although there is also some softening in the used sector for the variant, especially for older low gross weight aircraft. “Availability is lower at six units in June 2017, while there are about 19 stored aircraft,” adds Geach. “There is strong demand for the increased take-off variant (242 tonnes), especially in the Asia Pacific and from Delta.” The increased take-off version of the A330-300 has engine improvements and an additional centre fuel tank (ACT), offering extended range and fuel saving benefits. Orders to date across the -300 variants total about 760.

AVITAS adds that there remains an active leasing market for the -300, with demand moving away from the -200. “China, Japan and the Asia Pacific are showing strong leasing interest, which reflects their positions of growth,” adds Kelly. “These are proving to be the regions with a real need for increased widebody volume. Lease rate factors have become very aggressive. Rather than an expected factor of 0.8-0.85 we are seeing as low as 0.6, so the market is very competitive. The industry is concerned about upcoming lease expiry, as the small widebody operator base makes the secondary market more challenging.”

## A350-900

The A350-900 is the first series of the A350 family to enter into service, commencing commercial operations in January 2015 via Qatar Airways.

Airbus explains that the A350-900’s performance and capacity make it a

## Opening new markets

Over 150 new nonstop markets now connected with the 787



suitable replacement option for the 777-200/-200ER, A340-300/-500 and MD-11. Airbus adds that A350 XWB operators benefit from the family’s long-range capability and capacity. For example, the A350-900 allows airlines to grow from existing A330-sized operations or complement them. 85% of A350-900 customers are A330 operators. According to AVITAS, the A350-900’s most popular sector length is about 3,000nm, equivalent to London Heathrow-New York JFK, for example.

Latest Airbus figures show that there are 534 orders on backlog for the A350-900. IBA research shows the -900’s largest customers are Singapore Airlines (67 orders), and Qatar Airways (43). Global Fleets Analyser lists the following operators as intended order holders: Aer Lingus (9), Aeroflot (14), Afriqiyah Airways (10), Air Caraibes (1), Air China (10), Air France (21), Air Mauritius (6), AirAsia X (10), American Airlines (22), Asiana Airlines (11), Cathay Pacific (5), China Eastern (20), China Southern (20), Delta (25), Ethiopian (19), Etihad (40), Finnair (9), Hong Kong Airlines (15), Iberia (16), Japan Airlines (JAL) (18), KLM (7), Kuwait Airways (10), LATAM Airlines Brasil (6), Libyan Airlines (6), Lufthansa (22), Malaysia Airlines (6), Philippine Airlines (6), Qatar (24), SAS (8), Singapore Airlines (52), Thai Airways (8) and Vietnam Airlines (7) in addition to lessors.

According to Airbus specifications, a standard LOPA arrangement for the A350-900 is 325 passengers across three classes, comprising 34 seats in business class seats, 32 in premium economy seats, and 259 in standard economy.

“The shortest route performed by the -900 is 80nm, from Doha International Airport (DOH) to Bahrain (BAH) for

Qatar Airways,” says Kelly. “The longest is about 8,400nm, which is by Singapore Airlines from Singapore Changi (SIN) to San Francisco (SFO).”

“Airbus deliberately kept the EIS of the -900 as low key as possible, and was careful to ramp up production to just a moderate level,” says Jon Whaley, analyst at IBA. “However, at least 89 are now in service after 2.5 years since EIS and the operator base is growing nicely with China Airlines, Air Caraibes and Lufthansa among the most recent airlines to accept their aircraft. With more than 650 orders to date, the A350 series is very high in demand and complements the 787-9 well, even though the Boeing is a little smaller.”

## 787 Dreamliner

The in-service 787 comprises the 787-8 and -9 series. To date, over 550 have been delivered, and Tinseth says that 150 new routes have been introduced since its EIS. Most of these have been announced in 2016 and 2017, while the EIS of the -8 appears to be behind almost 120 of the new airport-pairs, particularly within the low-cost, long-haul segments for providers such as TUI and Norwegian. 12 routes have been announced, but not yet undertaken on the -8 and -9s. Norwegian has scheduled the launch of frequencies to Barcelona, Fort Lauderdale and Oakland, California for August 2017. September 2017 will see the start of Riyadh to Manchester by Saudi Arabian Airlines, in addition to routes out of Gatwick for Norwegian. In October 2017, KLM will launch Amsterdam to San Jose, and United will launch Los Angeles to Changi. Norwegian will also introduce Rome Fiumicino to Oakland, California in November 2017, while in



March 2018 Qantas will start Perth to London.

## 787-8

Demand for the 787-8 has slowed down since its EIS six years ago. IBA says that the largest customer for the -8 is All Nippon, with 36 in service and on order.

Average seating configuration in a two-class layout accommodates 242 passengers, according to Boeing.

Global Fleets Analyzer suggests there are 83 -8 orders pending, with operators such as Aeroflot (18), Air Astana (3), Air India (4), British Airways (4), El Al (2), Iraqi Airways (2), Oman Air (4), Royal Brunei Airlines (1) and Scoot (2).

According to Boeing there is a monthly production rate of 12 aircraft across the 787-8 and -9 series, which it says is high for widebody production. As the 787-10 EIS looms, Randy Tinseth, vice president marketing at Boeing Commercial Airplanes, expects a potential production increase to 14 per month to accommodate demand.

“While production is now more in favour of the -9, the -8 remains strong,” says Geach. “Our analysis shows no storage of passenger-configured aircraft either. The fleet is about 329 units, and the order backlog takes the sales total so far to more than 400 units although this could change. Also, there is no obvious or advertised availability of the -8 in the secondary market.” Boeing advises a current order backlog of 86 aircraft for the 787-8, as of July 2017.

“With more than 300 -8s in service, the 787-8 is still a successful programme regardless of upcoming orders,” adds Kelly. “The Asia Pacific is now its largest

market and growing fast, although I am unsure how long this momentum can last, given the rapid expansion.”

In terms of 787-8 routes, these began being announced in 2012, with JAL launching Tokyo-Boston. More followed in 2013, with eight routes being put into networks by Air India, All Nippon, Norwegian and United. TUI, Etihad and Norwegian are among operators to have implemented the most routes.

China Southern has 10 787-8s in service. It has opened six new non-stop global routes using 787s, connecting Guangzhou to Vancouver, London, Rome, Perth, Auckland and Christchurch (Boeing.com). In addition, EL AL has recently announced that it will operate new routes from Tel Aviv to Europe, North America and the Far East from September 2017. The Israeli operator intends to replace its 747 and 767 fleet via 16 787 orders and lease agreements.

## 787-9

EIS for the -9 was in 2014 via All Nippon and Air New Zealand, which was the official launch customer for the series. The -9 is 20 feet longer than the -8, and as such can accommodate 290 in a two-class configuration.

As highlighted, the -9 is responsible for more than 30 new routes and frequencies. According to AVITAS, the 787 performs 2,836 weekly frequencies on routes longer than 4,000nm. The longest routes are performed on the -9; including 7,600nm Los Angeles (LAX) to Singapore Changi (SIN). Qantas is due to launch a new Melbourne (MEL) to Perth (PER) to London Heathrow (LHR) route in March 2018, using its ordered -9s. The

*The A330ceo family comprises the A330-200 and -300 series. Between them, the two series have amassed over 1,400 orders across more than 120 operators.*

PER-LHR segment is about 7,800nm. The -9 will also be used on Air France’s Paris to Cairo route from January 2018.

All Nippon is also the largest customer for the 787-9, with 44 ordered and in operation. “Operators and lessors are always switching orders between different variants, and this is likely to continue across all aircraft families,” says McDonald. Production now clearly favours the -9, however, with strong penetration. The -9 is now the best-selling version of the 787 and accounts for most of current production.

“Today’s fleet size is 218 units and the strong order backlog takes the sales total so far to almost 700 units,” says Whaley. “There remains no advertised availability, and no storage of passenger-configured aircraft in the market. Demand for the -9 has proven to be very high, and the aircraft complements the A350-900 well, even though the Airbus is slightly larger.” Global Fleets Analyzer suggests over 450 orders for the -9 across 41 operators.

According to Boeing, since January 2012 there have been 279 787-9 orders, while for the same period only 60 orders were placed for the 787-8. This is in comparison to 149 orders in place for the 787-10 before EIS. Boeing advises a backlog of orders of 435 as of July 2017.

Tinseth has noticed an up-gauge in certain regions such as China, with operators moving from midsize aircraft into the 787-9. “This interest is likely to move into the 787-10 once it is in service,” he adds, “while Boeing has also seen South-East Asian operators starting to explore down-scaling from the 747 and A380 into the 787 series.” Boeing generally sees strongest demand for the 787 in SE and SW Asia, including India. Japanese carriers have also used the 787 to replace existing domestic widebody fleets and facilitate fleet growth by adding to long-haul fleets.

“Asian network carriers have competition on their international routes from Middle Eastern and Chinese operators,” says Tinseth. “We are therefore seeing a gradual retreat from some long-haul routes as the network airlines prioritise home-base and more local networks, rather than try to compete. The 787 offers a suitable option to move away from the ultra-large aircraft that perform these sectors.” Tinseth explains that the 787 family has proven popular with long-haul, low-cost operators, such as Norwegian Airlines

## AIRCRAFT IN PRODUCTION - TECHNICAL SPECIFICATIONS

Aircraft	A330-200**	A330-300	A350-900	787-8	787-9	777-300ER
Engines	CF6/Trent 700 /PW4000	CF6/Trent 700 /PW4000	Trent XWB	Trent 1000 /GEnx	Trent 1000 /GEnx	GE90-115B
MTOW (lbs)	533,500	533,500	617,290	502,500	560,000	775,000
MZFW (LB)	365,900-374,800	376,990-385,800		355,000	400,000	524,000
Max Payload (LB)				90,500	116,000	154,000
Fuel capacity (lb)	240,711	240,711	238,800	223,378	223,673	320,863
Max seating	406	440	440	381	420	396
Two-class seating				242	290	360
Three-class seating	247	277	325			
Range (standard) nm	7,250	6,350	8,100	7,355	7,635	7,370
Fuselage length (ft)	193'	208'11"	219'2"	186'	206'	242' 4"
Cabin length (Ft)	147'8"	165'3"	167'5"			
Cabin width (Ft)	17'4"	17'4"	18'5"	18'	18'	19'25"
In service	641*	683	94	332	225	739
On order	52	158	534	86	435	73

\* Including A330-200 Freighter orders

\*\* WV 80. Some data taken from Airbus Airport Compatibility Brochure, Feb 2016

and Scoot. Scoot operates a fleet of 14 787-8s and -9s, while Norwegian has 13 787s in service of its 32-strong order. Norwegian's 787-8 layout allows nine abreast and 291 passengers (32 in premium economy and 259 in economy), and its 787-9 seats 344 passengers (35 in premium economy and 309 in economy).

## In development

### A330neo

The A330neo programme was launched in July 2014, and comprises the A330-800 and -900 series.

Airbus says that the main rationale behind the A330neo programme was to offer the most efficient new-generation aircraft in the 250-300-seat category, while complementing the larger capacity provided by its A350 XWB family, and leveraging the success of the legacy A330ceo programme. The A330neo and A350 share a common type-rating.

The A330neo will be powered by Rolls-Royce Trent 7000 engines, and provide efficiency gains via aerodynamic modifications such as increased wingspan and standard composite Sharklets. These enhancements achieve a reduction in fuel burn that enable the new A330s to achieve greater range capabilities. The Airspace cabin, which is inspired by the

A350 XWB, is also present in the A330-800 and -900. Airspace offers the latest generation in-flight entertainment (IFE) systems and connectivity, a welcoming entrance area, mood lighting and more overhead bin space. Airspace cabins are also characterised by overall quietness 'designed-in' to the systems (such as ventilation outlets and galley equipment).

The -800 and -900 will share a high level of commonality with their A330ceo predecessors, including the same pilots, type-ratings and mechanics, about 95% airframe spares commonality, and up to 85% tooling commonality. The A330-800 fuselage has the same dimensions as the A330-200, while the -900 is the same as the -300.

The similarities between the -800 and -900 go even further. Since they share the same engines, the two series have the highest level of aircraft commonality for a widebody type with 99% for spares. The A330neo is designed to provide up to 400nm longer range, 14% lower fuel burn, and improved CO<sub>2</sub> and NO<sub>x</sub> emissions compared to the A330ceo.

IBA estimates that 10% of current A330ceo (-200 and -300) operators and lessors have placed orders for the A330neo (as of June 2017). These include CIT (15), Delta Air Lines (25), Garuda Indonesia (14), Iran Air (28), TAP Portugal (14), Air Lease Corporation (25) and AirAsia X (66). Each of these has

placed orders for the A330-900.

The -900 is the standout series on the current A330neo order book.

### A330-800

The A330-800 aims to tap into the A330-200 operator base of more than 95 operators, and offer an entry-level widebody solution to up-gauge from a large single-aisle aircraft such as the A321. Airbus has provided a standard three-class capacity figure of 257 across business-class, premium-economy and economy layouts. It also advises that the A330-800neo is slated for EIS in the second half of 2019. As of June 2017, six A330-800s are on order with one customer, Hawaiian Airlines.

### A330-900

Of the 210 firm orders in place for the A330neo, Airbus says that 204 are for the A330-900. The -900 series is on schedule for EIS in the summer of 2018, with TAP as the launch customer. Airbus has provided a typical seating configuration for 287 passengers in a three-class layout, based on 30 seats in business class, 28 in premium economy and 229 in economy. Maximum seating capacity for the A330-900 is certified at 440 passengers in a single economy-class, high-density configuration, which is being

*Boeing advises that since January 2012 there have been 279 787-9 orders, and 60 orders for the 787-8. This is in comparison to 149 orders received for the 787-10 before EIS. There is a total backlog of 435 787 orders as of July 2017.*

operated today by LionAir.

IBA provides a programme update for the series. “The first Rolls-Royce (RR) Trent 7000 engine was delivered in June, but there are apparently four airframes still sitting at Toulouse awaiting engines,” says McDonald. “The first flight has been pushed back to September 2017 at the earliest, despite being initially scheduled for the first half 2017, and despite the first A330-900neo airframe coming out of the paint shop in December 2016.”

“The A330neo’s Trent 7000 turbine is derived from the engine model already used on the 787,” says Geach. “RR, however, has installed ducts on the 7000 that bleed hot air over the A330’s wings for de-icing. The 787’s systems are totally different given its electronic architecture. The Trent 7000 therefore requires a great deal of testing before certification.”

It is clear that most demand for the A330neo is for the longer -900. Global Fleets Analyzer associates the following operators with orders: Air Mauritius (2), Air Asia X (66), Delta Airlines (25), Garuda Indonesia (14), Iran Air (28), WOW Air (4) and TAP Portugal (14).

## Boeing 777-X

Due to enter commercial service in three years via the -9X variant, the 777-X family features the new General Electric (GE) GE9X engine series. In addition, the -8X and -9X will feature composite wings for greater efficiency, and a lower cabin altitude. To accommodate the wingspan of the 777-X and its lighter composite wings, the wingtips will fold to allow for departure gate access at airport terminals. Chiefly, the 777-9X is a replacement for the 777-300ER, and will be seen on many current -200LR and -300ER routes following EIS. Tinseth explains, however, that as the 777-X’s in-service presence ramps up, it will also serve as a replacement option for the 747, A340 and A380 to promote growth in the Middle East.

“The 777-X family allowed Boeing to use newly available technology and build a new-generation platform that is a replacement option for the ageing 747 and 767 fleets,” says Tinseth. “The availability of this new technology made



it the best time to reinvest in our 777 programme; providing competition to the A330neo and A350-1000.”

While the 777-9X is more comparable to the A350-1000 in terms of capacity, the -8X will operate a similar market to the 787-8 and A330-200 series.

The same 777 cabin cross-section is present on the 777-X, although a new (unreleased) interior configuration will allow 10-abreast in economy. This will increase passenger capacity for the -8X and -9X to 375-425, based on a two-class layout of business and economy. This is in comparison to 313-396 for the 777-200 and -300ER series and their variants.

“The 777-X also features system improvements,” Tinseth explains. “The flightdeck is now consistent with the 787 family, so the types share a common type rating.” Boeing estimates a 20% reduction in maintenance costs for the 777-X compared to the 777-300ER, and improved fuel efficiency ‘in double digits’ given the GE9X engines installed. Overall, Boeing is confident that the fuel consumption of the -9X will be 11-12% better than the competition’s.

## 777-8

Boeing’s average seating configuration for the -8X has 375 passengers across business economy and economy, and up to 350 in a three-class layout. It is expected that the 777-8 will serve as a replacement aircraft on current 777-300ER routes.

IBA says that more than 50 firm orders have been placed for the -8X. This includes eight orders placed by Etihad, 35 by Emirates, and 10 by Qatar.

## 777-9

The average seating configuration indicated by Boeing for the -9X accommodates 425 passengers across business and economy, and up to 400 passengers in a three-class layout.

Order activity shows that the 777-9X has become the nucleus model, with the most orders. While the programme is still new, IBA understands that Boeing has had 340 orders and commitments for the 777-8X (53) and -9X (287). The -9X has had orders from Lufthansa (20), Etihad (17), Cathay Pacific (21), Emirates (115), Qatar (50) and All Nippon (20). IBA says that the rest are unidentified customers. “All 777-X customers, except Lufthansa, are current 777 operators,” adds Tinseth. Lufthansa is replacing its older A340 fleet via the 777-X.

According to Boeing, the schedule is for final assembly of the 777-9 in 2018, flight test in 2019, and delivery and EIS in 2020. EIS for the 777-8X will follow a few years after the -9X. Tinseth adds that the 777-X will primarily maintain route networks for operators, although the -8X, with additional range of 1,500nm over legacy counterparts, has the ability to open new routes for carriers.

“We’ll see a lot of 747 routes being performed by the 777-X after EIS,” says Kelly. “The 777-X emerges in the height of the replacement cycle for 747-400s.”

## A350-1000

The A350-1000 is a counterpart to the already in-service -900 series. Each series is powered by the RR Trent XWB, and features the Airspace cabin.



## AIRCRAFT IN DEVELOPMENT - PRELIMINARY TECHNICAL SPECIFICATIONS

Aircraft	A330-800	A330-900	A350-1000	787-10	777-8X	777-9X
Engine(s)	Trent 7000	Trent 7000	Trent XWB-97	Trent 1000 /GEnx	GE9X	GE9X
MTOW (lb)	533,500	533,500	679,000	560,000	775,000	775,000
MZFW (LB)	379,200-388,000	390,200-399,000	485,000	425,000***		524,918**
Fuel capacity (lb)	240,711****	240,711****	270,000	223,673***		350,410**
Max seating	406	440	440	440		
Two-class seating				330	375	425
Three-class seating	257	287	366		350	400
Range (standard) nm	7,500	6,550	7,950	6,430	8,700	7,600
Fuselage length (ft)	193'	208'10"	242'1"	224'	229'	252'
Cabin length (Ft)	147'8"	165'3"	190'5"			
Cabin width (Ft)	17'3"	17'3"	18'5"	18'	19'6"	19'6"
On order	6	204	211	149	340 combined	

\*\*Boeing Airport Compatibility brochure for 2-class layout, March 2017

\*\*\*Boeing Airport Compatibility brochure for 3-class layout, December 2015

\*\*\*\*Airbus Airport Compatibility brochure, January 2017

Airbus advises that the -1000 is due to enter commercial service in the last quarter of 2017 with Qatar Airways, which is the launch customer. Again, the longer fuselage of the -1000 appears to be more popular than the shorter -800, with more orders in place. Airbus says that production rates are ramping up, and it is confident of reaching its target of 10 per month by the end of 2018.

More than 210 A350-1000 orders are in the pipeline, according to Airbus. Global Fleets Analyzer has provided an order pipeline as follows (July 2017): Air Caraibes (3), Asiana Airlines (10), British Airways (18), Cathay Pacific (26), Etihad (22), Iran Air (16), JAL (13), LATAM Airlines Brasil (14), and Virgin Atlantic (12). Qatar is the largest order customer (37), followed by United Airlines (35).

"As of June 2017, the A350-1000 has made its first flight and is in its flight test programme," says Geach. "More than 200 -1000s have been ordered so far, fewer than IBA anticipated at this stage in the programme, so we believe the aircraft deserves to do a little better. Our feel is that sales will be forthcoming, although it is the A350-900 that clearly is garnering most of the A350 demand."

While no airlines have disclosed cabin layouts for the A350-1000 series, Airbus has indicated a typical seating arrangement for 366 passengers across three classes, including 46 seats in business class, 32 in premium economy and 288 in economy. This is close to the 777-300ER's standard configuration.

## 787-10

Boeing's standard cabin configuration for the 787-10, provided in a two-class layout, accommodates 330 seats.

Boeing expects delivery and EIS of the 787-10 to begin in the first half of 2018.

There are 149 787-10 orders in place. Etihad and Singapore Airlines have the largest orders, with 30 commitments each as of July 2017. "After a good start in 2013, sales of the 787-10 seem to have stagnated, although now that it is in the flight development stage some new orders should emerge," says Geach. Global Fleet Analyzer suggests orders from more operators: ANA (3), British Airways (12), Etihad (30), EVA Air (20) and KLM (7).

## Summary


Outside the 200-400-seat widebody segment, another long-haul development has emerged in the form of the A380plus, which was announced at the 2017 Paris Airshow. The enhancements that will comprise this latest addition to the model are summarised (*see Developments, page 6*). One enhancement is an increase in seat numbers of 72.

Given that narrowbodies are flying further and gaining efficiency, does IBA think that the next-generation single-aisle aircraft can meet the requirements of some of the shortest medium- to long-haul routes? "They will remain completely different markets," says Whaley. Widebodies will always have the

premium cabins up front and fly into major hub airports, and be favoured by legacy carriers on routes where demand is strong.

"Low-cost carriers (LCCs), however, are more likely to use the A321LR (jetBlue with Mint layout), and 737 MAX than other business models because these next-generation aircraft allow them to expand their route networks," adds Geach. LCCs such as Norwegian are operating into mainly secondary airports such as Stewart (for New York) and Providence (for Boston), with a much more leisure- rather than business-oriented customer base.

"While the A321LR and 737 MAX will not have an impact on the 200-400 seat widebody market, there is a real possibility that over-supply will severely affect secondary and leasing markets, and future orders," says Whaley.

Another consideration is the effect of downscaling from ultra-large widebodies, such as the 747 and A380. The maintenance and operating costs of a four-engined aircraft cannot make the same sort of economic sense; and the 200-400-seat sector remains the hub of most activity. This seems to be echoed in the lack of visible secondary activity for the in-service A380; once 10-year leasing deals start being concluded, will first-time operators look to take the A380 on? - CLD 

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