

The industry has followed some interesting developments since 2000. These include the emergence of several new major markets, and the limited growth or even decline of some established route networks. These have ultimately influenced the requirement for ultra large aircraft.

Who needs the A380 & for which routes?

Although the A380 has now been in operation for more than two years, the size of the market for ultra-large aircraft remains uncertain. The A380 and its rival, the 747-8, are needed to absorb further growth in passenger numbers on the world's busiest routes, which have the largest number of seats and frequencies, but they are also deployed on airport-pairs with slot constraints or limited scope for higher frequencies.

An examination of the seat capacity and frequencies on the world's busiest routes shows the routes that currently need ultra-large aircraft, and the way in which airlines operating these routes have developed capacity in terms of fleet planning in the decade since 2000. The key indicators are: whether they have increased, maintained or reduced overall capacity in terms of total seat numbers in response to passenger demand; whether they have changed service frequencies; which aircraft types they were using 10 years ago and which they are using now; and how average aircraft size has changed.

This examination may also suggest how airlines are likely to develop capacity in the future. Frequencies are certainly limited on some high-capacity routes, so any increases in passenger demand will have to be absorbed by higher load factors, but mainly by using larger types.

An example is the London, Heathrow (LHR) - Singapore (SIN) route. This is one of the busiest long-haul routes in the

world. Despite 10 years of global traffic growth, seat numbers on this city-pair have only increased by about 85,000, equal to 4.2% (see table, page 11) and the number of flights operated by all carriers has hardly changed. British Airways (BA), together with its alliance partner Qantas, and Singapore Airlines (SIA) remain the dominant carriers. All three have almost the same frequencies as they did 10 years ago, averaging seven daily flights. Qantas and SIA have increased capacity by using the A380 to provide almost three daily services, so average aircraft size has increased by 20 seats to 372 over the past 10 years.

Ten years ago, the world's busiest routes were found in the five traditional main markets: the transatlantic; the trans-Pacific; Europe-Asia; Japanese domestic; and intra-Asia-Pacific. Since then, the fast development of operations in India, China, and to and from the Middle East

has increased the number of main markets to eight.

Aircraft size requirements

Airlines operating on some of the world's busiest airport-pairs use narrowbodies for most or even all operations. Barcelona-Madrid, for example, is the world's eighth busiest route, with an annual one-way capacity of 3.05 million seats and 19,381 flights provided by four airlines: equal to more than 8,000 seats and 53 daily flights each way, all served by narrowbodies, with an average aircraft size of 157 seats.

The first stage of capacity development is for airlines to raise frequencies to their optimum level. This usually precedes an increase in aircraft size. This is reflected by a large increase in service frequencies on many routes over the past 10 years, and a reduction by



The general trend on many of the world's major routes has been for airlines to reduce operations with the 747 and increase frequencies while deploying smaller widebody types such as the A330, A340 and 777.

TRANSATLANTIC CAPACITY DEVELOPMENTS

Route	2010 Annual flights	Annual Seats	Aircraft size -seats	10-year difference -flights	10-year difference -seats	10-year difference -size
London, LHR-New York, JFK	5,935	1,643,252	277	-23.7%	-20.3%	4.6%
London, LHR-Los Angeles	2,743	821,388	299	-7.7%	-11.7%	-4.4%
Paris, CDG-New York, JFK	2,483	753,040	303	-7.7%	7.1%	16.0%
London, LHR-Toronto, YYZ	2,488	635,095	255	1.6%	5.1%	3.4%
London, LGW-Toronto, YYZ	399	104,056	261	111.1%	72.8%	-18.2%
London, LHR-Newark, EWR	3,103	709,042	229	70.1%	34.6%	-20.9%
London, LHR-Chicago, ORD	3,233	705,506	218	-12.5%	-29.0%	-18.9%
Paris, CDG-Montreal, YUL	1,969	628,900	319	125.3%	113.4%	-5.3%
London, LHR-WASH DC, IAD	2,529	589,175	233	15.4%	-5.0%	-17.6%
London, LHR-Boston, BOS	2,324	573,394	247	6.2%	4.5%	-1.6%
Frankfurt, FRA-Chicago, ORD	1,909	541,451	284	13.9%	13.6%	-0.3%
Paris, ORY-Pointe-a-Pitre, PTP	1,355	517,069	382	26.6%	11.1%	-12.3%
London, LHR-San Francisco, SFO	1,660	506,785	305	5.7%	-11.9%	-6.6%
Madrid, MAD-Buenos Aires, EZE	1,465	494,490	338	37.8%	25.0%	-9.3%
Paris, ORY-Fort de France, FDF	1,282	492,421	384	17.5%	11.3%	-5.3%
London, LHR-Miami, MIA	1,558	461,287	296	112.8%	131.6%	8.8%
Frankfurt, FRA-New York, JFK	1,454	456,563	314	-26.5%	-22.2%	5.8%
Madrid, MAD-New York, JFK	1,570	427,961	273	65.8%	57.2%	-5.2%
Frankfurt, FRA-Wash DC	1,632	420,639	258	18.6%	11.2%	-6.3%
London, LGW-Wash DC, IAD	1,439	397,111	276	-3.3%	-12.5%	-9.5%
London, LGW-Orlando, MCO	1,049	379,348	362	-3.3%	-3.3%	-12.5%
Amsterdam-Detroit, DTW	1,312	376,290	287	-13.6%	-21.1%	-8.7%
Rome, FCO-New York, JFK	1,361	354,255	260	25.6%	11.1%	-11.5%
Paris, CDG-Los Angeles, LAX	1,148	352,842	307	-6.1%	-6.7%	-0.7%
Madrid, MAD-Mexico City, MEX	1,303	351,337	270	81.5%	64.0%	-9.6%
Paris-CDG-Sao Paulo, GRU	1,344	347,659	259	26.2%	14.9%	-8.9%
Paris, CDG-Wash DC, IAD	1,189	340,104	286	-17.7%	-13.6%	4.9%
Frankfurt, FRA-Newark, EWR	1,098	327,731	298	50.4%	42.8%	-5.1%
Frankfurt, FRA-San Francisco, SFO	953	322,346	338	66.3%	77.6%	6.8%
Madrid, MAD-Lima, LIM	1,082	303,053	280	245.7%	273.1%	7.9%
Paris, CDG-Atlanta, ATL	1,095	303,014	277	9.3%	7.2%	-1.9%
Dublin, DUB-New York, JFK	1,029	298,474	290	103.0%	99.5%	-1.7%
Amsterdam-New York, JFK	994	288,237	290	-22.6%	-16.8%	7.6%
Paris, CDG-Rio de Janeiro, GIG	1,008	285,828	284	185.6%	200.5%	5.2%
London, LGW-Barbados, BGI	900	284,879	317	47.1%	40.5%	-4.5%
Amsterdam-Minneapolis St Paul ,MSP	938	273,190	291	28.1%	15.1%	-10.2%
Zurich, ZRH-New York, JFK	1,206	272,145	226	-3.9%	-2.0%	1.9%
London, LHR-Vancouver, YVR	899	270,139	300	-12.8%	0.2%	15.0%
Frankfurt, FRA-Sao Paulo, GRU	730	60,975	358	342.4%	595.9%	57.3%
Paris, CDG-Mexico City, MEX	977	257,810	264	34.4%	26.9%	-5.6%
Madrid, MAD-Bogota, BOG	857	255,472	298	50.1%	102.1%	34.6%
Madrid, MAD-Caracas, CCS	934	253,097	271	201.3%	193.9%	-2.4%
Madrid, MAD-Miami, MIA	914	250,932	275	-18.7%	-30.5%	-14.5%
London, LHR-Philadelphia, PHL	1,073	240,653	224	47.0%	35.4%	-7.9%

most airlines in the use of 747s on long-haul routes, where the aircraft has been exchanged for increased numbers of smaller widebodies in the 200-350 seat range, such as the A330, A340 and 777.

Several factors govern airlines' ability to increase frequencies, and their choice of aircraft size. The first is route length and physical constraints such as slot availability, time-zone changes, and attractive departure and arrival times.

Frequencies tend to be high on short-haul routes, as shown by the 53 daily services between Barcelona and Madrid. The world's busiest route is Sapporo-Tokyo, Haneda (HND), with a distance of 450nm, annual seat volumes of 7.15 million (see table, page 16), and more than 60 daily services.

In contrast, LHR-SIN, a route of 5,300nm, has only nine services a day, representative of the fact that frequencies

on long-haul routes are limited by time-zone constraints and airlines' need for attractive arrival and departure times.

Other constraints relate to airline's traffic rights and the number of hubs they operate from. An example is Emirates' operation from Dubai (DXB) to Toronto (YYZ). "Our traffic rights only permit us to fly three times per week, so we use to use the A380 on this route," explains Jochen Hoesch, manager fleet planning and research at Emirates. "Our overall strategy is to provide connecting long-haul services via Dubai, connecting an city-pair worldwide with only one stop in Dubai. Doing so, we need to equally balance capacity growth in all the major markets we serve in order to maximise the feeder function of the DXB hub and the resulting traffic flows.

"The number of destinations we serve has increased from 50 in 2000 to 98, and

our fleet has grown from 31 aircraft to 150 over the same period," says Hoesch. "Our smallest type is the A330-200, followed by the A340-300, A340-500, 777-200, 777-300, and the A380. When launching a new route we usually start with a frequency of a daily service, and in some cases we see sufficient demand to use the 777 as the first aircraft. In response to traffic growth on a route we tend to increase aircraft size as we maintain this daily frequency, and then grow the service to a twice or three times a day operation once we experience sufficient demand. The added frequencies are usually operated with one of the smaller types, while we continue to use a larger type on the first frequency. With further growth the second aircraft will go to a larger type. The past year saw our network capacity grow by 21%, while traffic grew at a higher rate.

"The A380 is used to grow capacity in mature markets or where capacity is restricted by existing traffic rights or slot constraints. "Our operations to London, Paris and Frankfurt are largely operated with higher capacity equipment because of the traffic volumes we enjoy. We now operate to London eight times a day, including two services with the A380, and also have a twice daily service to Paris, which also includes a daily A380 flight," continues Hoesch. "There are sometimes limits on increasing frequencies. Our route to Toronto is an example, because of the bilateral agreement.

"We are very focussed on maximising the connectivity for origin and destination passengers during the different connection banks at Dubai," continues Hoesch. "We have three main connection banks. Adding frequencies depends on the type of demand we are experiencing and the key markets we need to connect to. At the moment we largely use the A380 within the primary connection bank where traffic flows are highest. This is the most mature and has the highest number of connections. Going forward, the A380 will also be operated in the second and third banks as we continue to grow the network in response to traffic demand."

Emirates' need to increase aircraft size because of relatively limited frequencies contrasts with Lufthansa's position. Lufthansa operates long-haul operations from Frankfurt and Munich in Germany; together with its partners Austrian and Swiss, operating from Vienna and Zurich, it has four long-haul bases in close proximity. While twice-daily frequencies from each of these hubs may be desirable, they are expensive, so they can effectively provide up to four daily frequencies when all the hubs are taken into consideration. The destinations with the highest frequencies from these hubs include Hong

TRANS-PACIFIC CAPACITY DEVELOPMENTS

Route	2010 Annual flights	Annual Seats -seats	Average size	10-year difference -flights	10-year difference -seats	10-year difference -size
Honolulu, HNL-Tokyo, NRT	3,293	1,209,446	367	6.6%	-11.6%	-17.1%
Los Angeles, LAX-Tokyo, NRT	2,555	896,529	351	-25.3%	-36.1%	-14.5%
Los Angeles, LAX-Sydney, SYD	1,805	662,332	367	6.1%	3.0%	-2.9%
Guam, GUM-Tokyo, NRT	3,034	643,139	212	91.5%	11.4%	-41.9%
Los Angeles, LAX-Taipei, TPE	1,682	584,384	347	-16.6%	-24.3%	-9.2%
San Francisco, SFO-Tokyo, NRT	1,677	582,651	347	-7.2%	-26.1%	-20.3%
Chicago, ORD-Tokyo, NRT	1,460	548,595	376	-20.2%	-25.2%	-6.2%
Los Angeles, LAX-Seoul, ICN	1,782	548,458	308	9.1%	8.2%	-0.8%
New York, JFK-Tokyo, NRT	1,543	544,147	353	-8.7%	-33.3%	-27.0%
San Francisco, SFO-Hong Kong, HKG	1,460	517,790	355	32.8%	36.4%	2.7%
Vancouver, YVR-Hong Kong, HKG	1,066	375,984	353	-24.3%	-27.8%	-4.6%
San Francisco, SFO-Seoul, ICN	1,144	358,121	313	-2.6%	0.2%	2.9%
Los Angeles, LAX-Auckland, AKL	963	348,522	362	-22.2%	-25.4%	-4.1%
New York, JFK-Seoul, ICN	1,097	334,277	305	227.5%	197.9%	-9.0%
San Francisco, SFO-Taipei, TPE	927	322,793	348	-25.7%	-31.9%	-8.3%
Los Angeles, LAX-Hong Kong, HKG	834	321,086	385	-12.9%	-11.7%	1.4%
Guam, GUM-Osaka, KIX	1,560	306,631	197	36.2%	-33.0%	-50.8%
Honolulu, HNL-Osaka, KIX	732	300,891	411	-51.5%	-52.7%	-2.4%
Vancouver, YVR-Tokyo, NRT	731	271,041	371	-18.2%	-31.0%	-15.7%
San Francisco, SFO-Beijing, PEK	703	226,704	322	108.6%	91.7%	-8.1%
San Francisco, SFO-Sydney, SYD	561	210,794	376	53.3%	54.0%	0.5%
Obyan, SPN-Tokyo, NRT	1,107	204,410	185	52.1%	-40.8%	-61.1%
Seattle, SEA-Tokyo, NRT	730	202,268	277	-33.5%	-39.1%	-8.5%
Los Angeles, LAX-Melbourne	468	186,327	398	-25.9%	-21.6%	5.9%
Guam, GUM-Nagoya, NGO	1,095	182,243	166	-4.9%	-22.7%	-18.7%
Chicago, ORD-Seoul, ICN	560	181,555	324	60.5%	55.3%	-3.2%
Dallas Fort Worth, DFW-Tokyo, NRT	728	179,816	247	-4.5%	-25.1%	-21.6%
Honolulu, HNL-Nagoya, NGO	376	173,379	461	-48.7%	-56.3%	-14.8%
Vancouver, YVR-Beijing, PEK	716	171,280	239	82.7%	89.3%	3.6%
Vancouver, YVR-Seoul, ICN	623	158,195	254	12.7%	10.6%	-1.8%
Vancouver, YVR-Taipei, TPE	506	155,897	308	-43.0%	-55.5%	-21.9%
Seattle, SEA-Seoul, ICN	498	152,111	305	217.2%	246.0%	9.1%
Vancouver, YVR-Shanghai, PVG	560	150,809	269	865.5%	790.0%	-7.8%
Honolulu, HNL-Sydney, SYD	546	145,104	266	-3.7%	-8.8%	-5.3%
Honolulu, HNL-Seoul, ICN	452	139,824	309	23.5%	9.1%	-11.7%
Detroit, DTW-Tokyo, NRT	367	139,113	379	-24.9%	-29.4%	-5.9%
Agana, GUM-Seoul, ICN	492	138,532	282	-7.5%	11.4%	20.4%
Minneapolis St. Paul, MSP-Tokyo, NRT	365	138,359	379	-24.7%	-29.2%	-5.9%
Obyan, SPN-Seoul, ICN	590	132,501	225	61.2%	42.1%	-11.9%
San Francisco, SFO-Shanghai, PVG	365	126,650	347	406.9%	473.0%	13.0%
Guam, GUM-Manila, MNL	678	124,734	184	38.7%	35.4%	-2.3%
Los Angeles, LAX-Shanghai, PVG	369	120,294	326	846.2%	812.6%	-3.6%
Toronto, YYZ-Tokyo, NRT	365	119,248	327	36.7%	56.2%	14.2%
Atlanta, ATL-Tokyo, NRT	366	117,021	320	0.0%	23.0%	23.0%

Kong (HKG); Singapore (SIN); Tokyo, Narita (NRT); and New York (JFK). Only a few routes have twice-daily services from Frankfurt, and most have once-a-day operations.

In contrast, BA has concentrated most of its long-haul operations in recent years at a single hub: LHR. Unlike Emirates and Lufthansa, BA is less restricted on increasing frequencies. On many of its higher-density long-haul routes it has twice-daily services.

Larger-gauge aircraft

An increase in aircraft size will usually follow once the optimum frequencies and number of services have been achieved. This represents an increase in seat numbers and total capacity offered on a route. Most airlines' tri-class configurations for international

operations have fewer seats than the manufacturers' standard layouts.

The A330-200 is generally one of the smallest widebodies used, and is configured with 220-280 seats by most airlines. Seat numbers increase with the larger A340-300 and 777-200/-200ER to 230-310. The ultra-long-range 777-200LR is configured with 238 seats by Air India, and 270 seats by Air Canada. The next step up to the 777-300 is similar to, and in some cases larger than, the 747-400. Most 777-300s used on intra-Asian routes have relatively high-density configurations of 380-400. The long-range -300ER has 290-365 seats.

The 747-400, used on long-haul routes in similar markets to the 777-300ER, is configured with 300-400 seats by most airlines. Lufthansa, for example, has 350 seats, while it expects the 747-8 to have a tri-class seat count of 450 when

it enters service in late 2011.

The A380 has seat counts of 450-538, with Qantas having the lowest, and Air France the highest number. Emirates has two layouts of 489 and 517 seats.

Switching from a 747-400 to an A380 can therefore mean an increase of 100 or more seats; a jump in capacity of 40% or more. Although a similar increase in passenger numbers is only likely over a sustained period, A380 operators have noted that the aircraft has stimulated demand. "All our A380s are full full because of the type's great product and customer appeal," says Hoesch. "The aircraft offers an unmatched service experience, even in Economy class, and our premium cabins have excellent amenities such as the First class suites and spa showers and the Business class lounge, which are all very well perceived by our customers."

A change from a 747-400 to an A380 on the prime frequency on a route may be accompanied by a switch to a smaller type on the route's second or third frequency. This is the case with Singapore Airlines on LHR-SIN, where it has two flights with the A380 and one with the 777-300ER. Its daily capacity is similar to when it operated three 747-400 services.

In addition to its plans to operate the A380 at a single daily frequency on some prime routes, Lufthansa also has 20 firm orders for the 747-8. In terms of capacity, the 450-seat 747-8 will be about half-way between the 747-400 and A380. This allows the carrier to closely match capacity on each route with demand. It is possible the 747-8s will be used on routes to the West coast of the US.

Lufthansa also uses the A330-300, A340-300 and A340-600 to provide capacity for lower levels of demand, having opened 50 new long-haul routes over the past 10 years, particularly from Frankfurt and Munich. These smaller aircraft will be kept in the fleet, while the 747-8s and A380s may gradually replace the 747-400s, depending on market development.

In terms of annual seat capacity on a route, a single daily frequency with a 747-400 would provide 117,000-140,000 seats each way per year. An increase to a 747-8 would increase this by 18-40% to 165,000 seats. Using an A380 on a daily service would raise annual capacity still further to 190,000 seats.

The jump in capacity is not so large when operating twice daily with a 747-400, and taking the service at peak time to a 747-8 or A380. This would be equal to a capacity jump of 10-20% in the case of the 747-8, and 20-30% in the case of the A380. These increases in capacity can be moderated by switching to a smaller type on the second daily frequency if required.

An analysis of the eight major

markets with the world's highest-density routes has been made.

Transatlantic

Analysis of the 50 busiest routes in the transatlantic market indicates this market is mature. The capacity on these 50 routes collectively has only grown by 10% since 2000. Frequencies have overall risen at a higher rate, so average aircraft size has dropped by eight seats to 282.

It is clear that many of the major routes have lost traffic to the smaller airport-pairs. Total capacity at LHR-New York (JFK), for example, has declined by 20% (see table, page 8). Capacity has also declined on routes from LHR to Los Angeles (LAX), Washington DC (IAD), San Francisco (SFO) and Chicago (ORD).

Only two of these top 50 routes use the A380, and both are operated by Air France from Paris (CDG) to JFK and Montreal (YUL). Air France's capacity on these routes has jumped by 51% and 70% over the 10-year period, presumably with a proportionate increase in traffic. On CDG-JFK, Air France operates an average of nearly five daily flights, with 575,000 seats per year. On CDG-YUL, on which services have only just begun, it has three daily services and 333,000 seats per year.

Few of these 50 busiest routes have seen an increase in aircraft size, and most aircraft average fewer than 300 seats. There has also been a general reduction in the use of 747s in this market. BA, for example, has swapped some of its second daily frequencies on many routes from the 747-400 to 777-200s. Besides LHR-JFK, BA operates with double or single daily frequencies on most of its routes to Canada and the US. In many cases it has reduced its overall capacity on transatlantic routes.

Only those routes with high rates of growth have seen a significant increase in aircraft size. Iberia has had significant growth on routes from Madrid (MAD) to Lima (LIM), Bogota (BOG) and Caracas (CCS), so it has switched to larger types. Even though capacity on MAD-LIM has almost quadrupled, aircraft still average fewer than 300 seats.

Other fast growing routes are LHR-Miami (MIA), which has seen capacity more than double. BA and American Airlines have simply doubled frequencies with the same aircraft types.

Overall, there are few routes in this market where an individual carrier's capacity will require the A380.

One exception is CDG-YUL, where Air France operates three daily services. Operating the A380 on a daily service would increase Air France's annual capacity by 70,000 seats to 400,000, unless it downsized aircraft on the other two services.

EUROPE-ASIA CAPACITY DEVELOPMENTS

Route	2010 Annual flights	Annual Seats	Average size -seats	10-year difference -flights	10-year difference -seats	10-year difference -size
London, LHR-Hong Kong, HKG	3,157	1,082,146	343	72.6%	76.3%	2.1%
London, LHR-Singapore, SIN	2,453	913,244	372	4.2%	10.2%	5.7%
Paris, CDG-Tokyo, NRT	1,625	671,246	413	11.0%	-4.3%	-13.8%
London, LHR-Bangkok, BKK	1,749	619,929	354	53.7%	60.7%	4.5%
London, LHR-Delhi, DEL	2,291	610,900	267	264.8%	179.4%	-23.4%
London, LHR-Mumbai, BOM	2,181	600,493	275	220.7%	152.1%	-21.4%
London, LHR-Tokyo, NRT	1,451	529,419	365	-24.1%	-32.6%	-11.1%
Frankfurt, FRA-Singapore, SIN	1,457	503,452	346	8.2%	6.5%	-1.6%
Frankfurt, FRA-Tokyo, NRT	1,093	442,508	405	-8.9%	-21.1%	-13.3%
Frankfurt, FRA-Bangkok, BKK	1,095	411,240	376	-14.9%	-12.6%	2.6%
Moscow, DME-Yekaterinburg, SVX	2,571	394,244	153	286.0%	161.3%	-32.3%
Paris, CDG-Hong Kong, HKG	1,075	364,790	339	46.9%	28.8%	-12.3%
Frankfurt, FRA-Shanghai, PVG	1,153	340,610	295	220.3%	177.2%	-13.4%
Frankfurt, FRA-Beijing, PEK	1,081	333,236	308	71.6%	60.3%	-6.6%
Moscow, DME-Novosibirsk, OVB	2,081	321,467	154	12906.3%	12302.3%	-4.6%
Paris, CDG-Shanghai, PVG	1,090	319,465	293	772.0%	747.2%	-2.8%
Moscow, SVO-Beijing, PEK	1,096	311,545	284	170.0%	180.1%	3.8%
Frankfurt, FRA-Seoul, ICN	994	305,515	307	52.0%	64.7%	8.3%
Paris, CDG-Beijing, PEK	968	293,806	304	60.5%	55.0%	-3.5%
Paris, CDG-Singapore, SIN	730	290,430	398	-12.5%	-1.6%	12.5%
Amsterdam, AMS-Bangkok, BKK	839	285,625	340	-4.2%	-4.6%	-0.4%
Paris, CDG-Seoul, SEL	886	282,810	319	83.1%	89.1%	3.3%
London, LHR-Kuala Lumpur, KUL	730	281,780	386	-27.7%	-19.3%	11.6%
Paris, CDG-Bangkok, BKK	803	279,519	348	9.7%	7.6%	-1.9%
Amsterdam, AMS-Kuala Lumpur, KUL	732	276,783	378	22.0%	64.5%	34.8%
Frankfurt, FRA-Hong Kong, HKG	723	265,095	367	-0.8%	-0.8%	0.0%
Amsterdam, AMS-Singapore, SIN	730	257,046	352	-29.7%	-25.2%	6.5%
Amsterdam, AMS-Hong Kong, HKG	727	240,431	331	32.4%	36.3%	3.0%
Frankfurt, FRA-Mumbai, BOM	668	231,368	346	6.7%	36.4%	27.8%
Copenhagen, CPH-Bangkok, BKK	679	219,252	323	17.3%	23.9%	5.6%
Frankfurt, FRA-Delhi, DEL	730	214,828	294	99.5%	67.7%	-15.9%
London, LHR-Shanghai, PVG	784	211,601	270	575.9%	492.3%	-12.4%
Moscow, SVO-Yekaterinburg, SVX	1,458	208,577	143	177.2%	222.5%	16.3%
Amsterdam, AMS-Beijing, PEK	723	206,104	285	191.5%	192.8%	0.4%
London, LHR-Seoul, ICN	586	190,581	325	123.7%	117.1%	-2.9%
Rome, FCO-Tokyo, NRT	549	189,594	345	3129.4%	1942.6%	-36.8%
Amsterdam, AMS-Tokyo, NRT	661	176,592	267	-0.8%	-36.8%	-36.4%
Zurich, ZRH-Bangkok, BKK	699	173,607	248	-7.4%	-13.6%	-6.7%
Zurich, ZRH-Singapore, SIN	427	172,553	404	-18.2%	-1.9%	19.9%
Moscow, DME-Krasnoyarsk, KJA	1,181	170,288	144	117.9%	91.6%	-12.1%
London, LHR-Beijing, PEK	704	168,154	239	104.1%	80.2%	-11.7%
Vienna, VIE-Bangkok, BKK	525	165,859	316	23.8%	45.3%	17.4%
Moscow, SVO-Novosibirsk, OVB	1,146	164,147	143	124.3%	136.4%	5.4%
Moscow, DME-Tashkent, TAS	882	162,370	184	177.4%	270.0%	33.4%

BA is the other carrier with the largest presence in the market. It operates six daily flights on LHR-JFK, but its capacity on this route has dropped. This is still one of the prime candidates for BA to deploy the A380. If it changed one of its daily operations for an A380 service it would increase its annual capacity by 73,000 seats.

BA also operates 747s three times a day to LAX and twice daily to SFO and MIA. If it were to substitute one of these daily services with the A380 it would increase its annual capacity by 66,000 seats in each case: an increase of 30%.

Lufthansa is likely to use the A380 from FRA to LAX, SFO, JFK and ORD. Its capacity on these routes is small compared to that of Air France, which uses the A380. Lufthansa operates twice a day from FRA to JFK and provides 240,000 seats annually. Annual capacity

on the SFO route is only 128,000 seats. Capacity is provided by a mix of 747s, A340-300s, A340-600s and A330-300s, so using the A380 will result in a large increase in capacity.

Trans-Pacific

There has been a 13.4% reduction in capacity across the top 50 routes on the Trans-Pacific since 2000. All but seven routes have had a large drop in annual seat numbers, while average aircraft size has fallen from 375 seats to 314.

The Trans-Pacific was for many years dominated by Japan Airlines, United Airlines and Northwest Airlines operating between major cities in the US and Tokyo, and then on to major cities in the Asia Pacific. There have been a few routes from the US to Osaka in more recent years. This domination is due to these

INTRA-ASIA-PACIFIC CAPACITY DEVELOPMENTS

Route	2010 Annual flights	Annual Seats	Average size -seats	10-year difference -flights	10-year difference -seats	10-year difference -size
Hong Kong, HKG-Taipei, TPE	12,836	4,084,489	318	17.8%	13.4%	-3.7%
Jakarta, CGK-Singapore, SIN	11,976	2,584,386	216	70.8%	47.1%	-13.8%
Jakarta, CGK-Surabaya, SUB	13,633	2,446,272	179	76.5%	187.3%	62.7%
Hanoi, HAN-Saigon, SGN	9,124	2,051,759	225	171.5%	274.1%	37.8%
Phuket, HKT-Bangkok, BKK	8,826	2,029,956	230	49.4%	28.1%	-14.3%
Bangkok, BKK-Hong Kong, HKG	6,034	1,898,894	315	8.3%	1.9%	-5.9%
Medan, MES-Jakarta, CGK	10,185	1,895,436	186	222.1%	354.5%	41.1%
Jakarta, CGK-Denpasar, DPS	9,920	1,853,479	187	184.9%	110.4%	-26.1%
Hong Kong, HKG-Singapore, SIN	5,912	1,784,464	302	18.6%	5.6%	-11.0%
Seoul, ICN-Tokyo, NRT	5,238	1,483,608	283	38.1%	8.8%	-21.2%
Manila, MNL-Cebu, CEB	8,175	1,603,023	196	21.5%	36.0%	11.9%
Hong Kong, HKG-Manila, MNL	5,894	1,586,438	269	55.5%	23.6%	-20.5%
Bangkok, BKK-Singapore, SIN	6,241	1,569,292	251	8.6%	-6.5%	-13.9%
Melbourne, MEL-Adelaide, ADL	9,374	1,548,217	165	30.3%	60.5%	10.1%
Jakarta, CGK-Ujung Pandang, UPG	8,379	1,456,716	174	391.4%	495.6%	21.2%
Bangkok, BKK-Chiang Mai, CNX	6,636	1,433,646	216	53.6%	28.2%	-16.5%
Jakarta, CGK-Yogyakarta, JOG	7,664	1,388,730	181	257.6%	586.1%	91.8%
Tokyo, NRT-Taipei, TPE	4,711	1,387,518	295	157.4%	90.7%	-25.9%
Keku, CJU-Busan, PUS	8,459	1,344,209	159	61.9%	1.3%	-37.4%
Kita Kyushu, KKJ-Tokyo, HND	8,882	1,308,981	147	883.6%	981.8%	10.0%
Kota-Kinabalu, BKI-Kuala Lumpur, KUL	7,311	1,260,961	172	289.1%	283.9%	-1.3%
Tokyo, NRT-Shanghai, PVG	4,617	1,257,456	272	376.0%	191.7%	-38.7%
Auckland, AKL-Christchurch, CHC	8,406	1,247,778	148	-3.6%	22.8%	27.4%
Hong Kong, HKG-Tokyo, NRT	3,588	1,214,049	338	8.8%	-15.3%	-22.2%
Seoul, ICN-Hong Kong, HKG	3,752	1,164,011	310	39.2%	33.5%	-4.1%
Kuala Lumpur, KUL-Kuching, KCH	6,728	1,159,154	172	169.6%	216.4%	17.4%
Auckland, AKL-Sydney, SYD	5,105	1,089,687	213	52.5%	17.5%	-22.9%
Jakarta, CGK-Palembang, PLM	6,317	1,088,548	172	234.2%	467.2%	69.7%
Manila, MNL-Singapore, SIN	5,016	1,074,875	214	176.4%	129.1%	-17.1%
Adelaide, ADL-Sydney, SYD	6,572	1,060,096	180	-0.5%	25.3%	40.5%
Kuala Lumpur, KUL-Jakarta, CGK	5,957	1,051,378	176	255.2%	285.9%	8.6%
Kuala Lumpur, KUL-George Town, PEN	6,296	1,051,039	167	46.7%	49.8%	2.1%
Kuala Lumpur, KUL-Bangkok, BKK	5,099	1,019,338	200	182.6%	108.8%	-26.1%
Seoul, ICN-Shanghai, PVG	4,569	1,004,115	220	11615.4%	10856.0%	-6.5%
Bangkok, BKK-Tokyo, NRT	3,264	1,000,023	306	19.3%	-4.2%	-19.7%
Jakarta, CGK-Semarang, SRG	6,751	993,702	147	203.1%	355.4%	50.2%
Manila, MNL-Davao City, DVO	4,866	988,892	203	49.3%	79.2%	20.0%
Asahikawa, AKJ-Tokyo, HND	4,429	969,372	219	85.1%	51.1%	-18.4%
Seoul, ICN-Beijing, PEK	4,231	950,301	225	198.2%	141.9%	-18.9%
Bangkok, BKK-Taipei, TPE	3,139	917,152	292	-2.0%	-10.6%	-8.8%
Sydney, SYD-Singapore, SIN	2,497	879,427	352	4.3%	10.7%	6.2%
Da Nang, DAD-Saigon, SGN	4,678	871,275	186	376.4%	532.2%	32.7%
Seoul, ICN-Bangkok, BKK	3,105	865,912	279	85.3%	80.7%	-2.5%
Tokyo, NRT-Singapore, SIN	2,858	858,116	300	14.9%	-18.0%	-28.7%
Jinghong, JHG-Kunming, KMG	6,148	844,722	137	84.6%	69.8%	-8.1%
Denpasar, DPS-Singapore, SIN	3,504	838,035	239	99.0%	69.1%	-15.0%
Macau, MFM-Taipei, TPE	4,639	830,296	179	-7.8%	-8.2%	-0.4%
Jakarta, CGK-Pekanbaru, PKU	4,517	800,075	177	224.3%	495.5%	83.7%
Hong Kong, HKG-Kaohsiung, KHH	3,084	796,137	258	18.4%	23.5%	4.3%
Iloilo, ILO-Manila, MNL	4,849	793,380	164	31.2%	86.4%	42.0%
Hong Kong, HKG-Kuala Lumpur, KUL	2,905	785,231	270	45.2%	38.2%	-4.8%
Surabaya, SUB-Ujung Pandang, UPG	5,067	749,432	148	155.4%	265.6%	43.2%
Shanghai, PVG-Osaka, KIX	3,650	747,954	205	242.1%	109.4%	-38.8%
Kuala Lumpur, KUL-Langkawi, LGK	4,451	736,512	165	195.0%	247.0%	17.7%
Seoul, ICN-Taipei, TPE	2,404	703,441	293	180.2%	139.8%	-14.4%
Osaka, KIX-Seoul, ICN	2,929	697,170	238	-14.0%	-26.3%	-14.3%
Auckland, AKL-Melbourne, MEL	2,641	528,034	200	50.9%	36.6%	-9.5%
Seoul, ICN-Qingdao, TAO	2,958	524,227	177	304.1%	268.9%	-8.7%
Seoul, ICN-Singapore, SIN	1,660	511,130	308	1.4%	10.2%	8.7%
Fukuoka, FUK-Seoul, ICN	1,835	495,318	270	67.1%	62.0%	-3.1%
Seoul, ICN-Nagoya, NGO	1,825	466,395	256	66.2%	53.2%	-7.9%
Auckland, AKL-Blenheim, BHE	2,331	452,773	194	-12.6%	0.8%	15.3%
Adelaide, ADL-Brisbane, BNE	2,665	386,604	145	155.3%	169.2%	5.5%
Adelaide, ADL-Perth, PER	2,478	361,772	146	16.2%	30.3%	12.1%

carriers' fifth freedom rights between Japan and various Asia-Pacific cities.

Other airlines' lack of fifth freedom rights and ultra-long-range aircraft

prevented them operating trans-Pacific routes via Tokyo for technical refuelling stops. The advent of ultra-long-range aircraft over the past 10 years, in

particular the 777-200ER, 777-200LR, 777-300ER, and the A340-500, has changed the trans-Pacific market.

A lot of new direct routes from major cities to Asia Pacific hubs have been opened, bypassing Tokyo and Osaka. These new airport-pairs have drawn passenger traffic away from the routes transiting Japan, thereby reducing capacity on these sectors.

Overall, 12 routes from points in North America to Tokyo have seen reductions in seat numbers, as have three routes to Osaka, and three to Taipei. These are substantial capacity reductions, with most seeing cuts of at least 25%.

The two busiest routes, Honolulu (HNL)-NRT and LAX-NRT have seen seat numbers decline by 11.6% and 36.1% (see table, page 10). SFO-NRT and JFK-NRT have seen drops of 26.1% and 33.3%. The incumbent carriers have been hurt the most, particularly JAL. Of the 12 routes to NRT, it has pulled out of five and reduced capacity on another four. United has also dropped capacity on some, and left ORD-NRT. Northwest Airlines has cut capacity on SFO-NRT, Detroit (DTW)-NRT and Minneapolis St. Paul (MSP)-NRT.

Only three routes to NRT have seen a capacity increase, and two, originating from YYZ and Atlanta (ATL), are small.

Of the top 50 routes in this market, 24 have had capacity collectively reduced by 30%, equal to 3.5 million seats each way per year. Frequencies have not been reduced by the same amount, as airlines have swapped the 747 for smaller types. There is clearly little need for larger types on these routes.

Despite this, the A380 is still operated by Qantas on LAX-Melbourne, a route whose seat numbers have fallen by 22%. This is explained by Qantas taking advantage of United leaving the route, which operated daily with a 747-400. Virgin Australia has now entered the route, however.

Trans-Pacific routes that have needed a growth in capacity increases are from major US international hubs to the major Asia-Pacific cities of Sydney, Seoul, Hong Kong, Beijing and Shanghai. Of the 50 busiest routes in this market, 20 have seen annual one-way seat numbers grow by 2.2 million, equal to an increase of 38%. Capacity on some routes has doubled, tripled or even quadrupled. In the case of Vancouver (YVR) - Shanghai (PVG) and LAX-PVG, capacity has increased about tenfold in both cases; the routes being very young in 2000.

Many of these routes had small operations in 2000, and frequencies on all have increased, so average aircraft size on most is less than 300 seats. Only the longest routes have seen an increase in average seat numbers and aircraft size.

In addition, a large number of new

JAPANESE DOMESTIC CAPACITY DEVELOPMENTS

Route	2010 Annual flights	Annual Average Seats size -seats	10-year difference -flights	10-year difference -seats	10-year difference -size	
Sapporo, CTS-Tokyo, HND	22,452	7,146,224	318	46.7%	5.6%	-28.0%
Fukuoka, FUK-Tokyo, HND	16,863	4,835,896	287	23.9%	-17.7%	-33.5%
Tokyo, HND-Okinawa, OKA	9,242	3,656,741	396	48.8%	49.8%	0.7%
Tokyo, HND-Osaka, ITM	10,585	3,569,037	337	71.7%	20.0%	-30.1%
Tokyo, HND-Kagoshima	6,222	1,689,912	272	38.5%	4.2%	-24.7%
Hiroshima, HIK-Tokyo, HND	5,344	1,526,617	286	11.0%	-6.8%	-16.1%
Tokyo, HND-Kumamoto, KMJ	5,815	1,325,510	228	55.7%	14.1%	-26.7%
Ishigaki, ISG-Okinawa, OKA	8,979	1,242,112	138	75.2%	74.9%	-0.2%
Tokyo, HND-Osaka, KIX	6,844	1,210,384	177	37.8%	-26.8%	-46.9%
Tokyo, HND-Matsuyama, MYJ	4,015	1,136,723	283	29.0%	17.7%	-8.8%
Tokyo, HND-Nagasaki, NGS	4,359	1,065,316	244	25.3%	-7.4%	-26.1%
Fukuoka, FUK-Okinawa, OKA	5,508	1,026,166	186	25.2%	6.4%	-15.0%
Tokyo, HND-Miyazaki, KMI	5,552	991,637	179	51.6%	-15.3%	-44.1%
Ashikawa, AKJ-Tokyo, HND	4,429	969,372	219	85.1%	51.1%	-18.4%
Tokyo, HND-Takamatsu, TAK	3,650	923,696	253	24.7%	9.2%	-12.4%
Tokyo, HND-Oita, OIT	4,015	893,262	222	9.7%	-8.5%	-16.6%
Hakodate, HKD-Tokyo, HND	3,285	862,971	263	22.3%	-11.5%	-27.7%
Osaka, ITM-Sendai, SDJ	5,239	820,465	157	70.7%	24.4%	-27.1%
Sapporo, CTS-Nagoya, NGO	4,586	733,881	160	-6.5%	-33.9%	-29.3%
Osaka, ITM-Kagoshima, KOJ	3,751	733,356	196	-2.7%	-15.6%	-13.3%
Sapporo, CTS-Sendai, SDJ	5,935	701,645	118	106.6%	3.1%	-50.1%
Sapporo, CTS-Osaka, KIX	3,054	694,151	227	-15.1%	-42.7%	-32.5%
Tokyo, HND-Okayama, OKJ	3,285	692,496	211	111.1%	96.6%	-6.9%
Osaka, KIX-Okinawa, OKA	3,151	652,171	207	6.7%	-6.9%	-12.7%
Tokyo, HND-Kochi, KCZ	2,920	635,467	218	6.4%	-5.1%	-10.8%
Tokyo, HND-Ube, UBJ	2,920	624,081	214	59.6%	28.2%	-19.6%
Tokyo, HND-Toyama, TOY	2,190	586,110	268	7.1%	0.0%	-6.7%
Miyakojima, MMY-Okinawa, OKA	4,117	577,480	140	3.7%	4.2%	0.4%
Akita, AXT-Tokyo, HND	2,555	574,231	225	16.2%	-11.8%	-24.1%
Fukuoka, FUK-Osaka, ITM	3,983	552,666	139	6.2%	-46.9%	-50.0%
Aomori, AOJ-Tokyo, HND	2,190	523,910	239	-25.6%	-32.8%	-9.7%
Osaka, ITM-Kumamoto, KMJ	3,049	502,983	165	38.6%	-5.1%	-31.5%
Osaka, ITM-Tokyo, NRT	1,460	493,850	338	99.5%	56.0%	-21.8%
Fukuoka, FUK-Nagoya, NGO	4,380	456,112	104	-20.2%	-59.5%	-49.2%
Izumo, IZO-Tokyo, HND	1,825	415,048	227	17.4%	14.0%	-2.9%
Osaka, ITM-Miyazaki, KMI	2,380	410,703	173	-20.9%	-33.4%	-15.8%
Obihiro, OBO-Tokyo, HND	1,460	402,616	276	-0.3%	-2.8%	-2.5%
TOTAL	191,589	45,854,998	239	30%	-1%	-24%

INDIAN DOMESTIC CAPACITY DEVELOPMENTS

Route	2010 Annual flights	Annual Average Seats size -seats	10-year difference -flights	10-year difference -seats	10-year difference -size	
Mumbai, BOM-Delhi, DEL	20,401	3,453,686	169	132.8%	126.4%	-2.7%
Bengaluru, BLR-Delhi, DEL	9,277	1,529,639	165	271.1%	343.5%	19.5%
Bengaluru, BLR-Mumbai, BOM	9,563	1,415,963	148	117.4%	112.5%	-2.3%
Kolkata, CCU-Delhi, DEL	6,854	1,168,363	170	348.6%	304.9%	-9.7%
Chennai, MAA-Mumbai, BOM	6,675	1,049,287	157	87.0%	72.5%	-7.8%
Ahmedabad, AMD-Mumbai, BOM	5,944	981,854	165	131.0%	157.6%	11.5%
Hyderabad, HYD-Delhi, DEL	5,803	970,523	167	428.5%	391.5%	-7.0%
Hyderabad, HYD-Mumbai, BOM	5,997	966,281	161	115.8%	115.4%	-0.2%
Delhi, DEL-Chennai, MAA	5,909	965,003	163	213.8%	216.4%	0.8%
Mumbai, BOM-Kolkata, CCU	5,573	901,097	162	193.5%	190.6%	-1.0%
Mumbai, BOM-Goa, GOI	5,515	884,567	160	183.3%	176.2%	-2.5%
Bengaluru, BLR-Hyderabad, HYD	5,805	618,796	107	547.2%	367.7%	-27.7%
Mumbai, BOM-Kochi, COK	3,686	618,591	168	130.2%	144.2%	6.1%
Bengaluru, BLR-Chennai, MAA	5,793	572,853	99	78.7%	36.1%	-23.8%
Kolkata, CCU-Guwahati, GAU	3,780	554,757	147	280.7%	222.8%	-15.2%
Ahmedabad, AMD-Delhi, DEL	3,544	552,702	156	165.5%	172.6%	2.7%
Delhi, DEL-Pune, PNQ	3,261	520,566	160	348.6%	398.0%	11.0%
Hyderabad, HYD-Chennai, MAA	4,770	484,830	102	392.8%	299.0%	-19.0%
Delhi, DEL-Lucknow, LKO	3,240	458,607	142	103.9%	109.9%	3.0%
Mumbai, BOM-Jaipur, JAI	2,619	454,870	174	235.8%	420.4%	55.0%
Srinagar, SXR-Delhi, DEL	2,448	402,566	164	568.9%	708.8%	20.9%

routes have opened in this market, from major North American hubs to Hong Kong, Taipei, Shanghai, Beijing, Bangkok, Singapore, Seoul, Sydney and Auckland. Routes have also opened from the US to Delhi, Mumbai and Lahore, and from Toronto to Islamabad, Karachi and Lahore. These new routes include Singapore Airlines' daily service from New York Newark (EWR) to SIN, operated by an A340-500 configured with just 100 seats, providing just over 36,000 seats each way annually. Most of these new routes are served with the 777-200ER, 777-200LR and 777-300ER.

One of the few trans-Pacific routes that could conceivably require the A380 or 747-8 is Korean Air's service on the LAX-Seoul, Incheon (ICN) route. The airline has three daily services and provides 332,000 seats per year, mainly with 747s and 777-300s. Upgrading one daily service to an A380 would increase annual capacity by about 60,000 seats.

Europe-Asia Pacific

Most routes in the Europe-Asia Pacific market have experienced capacity growth over the past 10 years, with a collective increase of 83% in seat numbers. Frequencies have increased at a higher rate, however, as many airlines have swapped a lot of 747 operations for smaller aircraft and higher frequencies since 2000.

A group of 12 routes, however, has had a reduction in seat capacity, including four operated by JAL to Tokyo, Narita from CDG, LHR, FRA and Amsterdam (AMS). In some cases JAL has cut the number of services, and in others it has switched from a 747-400 to a 777-300ER. Lufthansa has taken advantage of JAL's reduction on FRA-NRT, by upgrading its service to the A380.

The two busiest routes in this market are LHR-HKG and LHR-SIN, with 1.08 million passengers and 913,000 seats each way per year (see table, page 11). Despite competition from Emirates and other carriers in the Middle East drawing traffic away from non-stop routes in this market, many airport-pairs have seen large increases in capacity.

On LHR-SIN, Singapore Airlines has replaced its three daily 747-400 services with two using the A380 and one using the 777-300ER, without increasing the total capacity it provides over the 10-year period. Qantas has also increased its fifth freedom capacity on the route and used the A380 for its additional frequencies.

On LHR-HKG, large growth has resulted from Cathay Pacific moving its operations from London Gatwick to LHR. Also, Air New Zealand changed its operation from Auckland to London from a transit at LAX to a transit at HKG. Qantas now also uses HKG for a

CHINESE DOMESTIC CAPACITY DEVELOPMENTS

Route	2010 Annual flights	Annual Seats	Average size -seats	10-year difference -flights	10-year difference -seats	10-year difference -size
Beijing, PEK-Shanghai, SHA	13,593	3,729,642	274	184.4%	197.8%	4.7%
Chengdu, CTU-Beijing, PEK	10,004	1,973,936	197	305.5%	268.3%	-9.2%
Guangzhou, CAN-Beijing, PEK	7,669	1,959,022	255	101.8%	97.7%	-2.0%
Beijing, PEK-Shenzhen, SZX	8,002	1,953,690	244	209.9%	211.0%	0.3%
Guangzhou, CAN-Shanghai, SHA	8,235	1,834,332	223	160.8%	141.6%	-7.4%
Shanghai, SHA-Shenzhen, SZX	7,657	1,668,850	218	183.0%	212.2%	10.3%
Hangzhou, HGH-Beijing, PEK	8,131	1,437,646	177	379.1%	430.2%	10.7%
Beijing, PEK-Xian, XIY	7,920	1,402,911	177	139.3%	113.5%	-10.8%
Guangzhou, CAN-Hangzhou	7,200	1,181,861	164	308.9%	185.6%	-30.1%
Kunming, KMG-Beijing, PEK	6,301	1,176,800	187	240.8%	196.8%	-12.9%
Guangzhou, CAN-Chengdu, CTU	7,147	1,170,048	164	259.0%	174.9%	-23.4%
Shanghai, SHA-Xiamen, XMN	6,703	1,127,600	168	407.0%	337.4%	-13.7%
Chengdu, CTU-Shanghai, PVG	6,366	1,094,813	172	5205.0%	5711.1%	9.5%
Nanjing, NKG-Beijing, PEK	6,059	1,064,239	176	230.2%	235.1%	1.5%
Chongqing, CKG-Beijing, PEK	6,139	1,005,826	164	495.4%	535.1%	6.7%
Dalian, DLC-Beijing, PEK	5,747	991,494	173	119.0%	125.5%	3.0%
Dalian, DLC-Shanghai, PVG	5,419	937,293	173	324.7%	282.8%	-9.9%
Chengdu, CTU-Shenzhen, SZX	5,658	914,454	162	212.4%	217.6%	1.7%
Beijing, PEK-Wuhan, WUH	5,329	877,962	165	249.0%	258.1%	2.6%
Harbin, HRB-Beijing, PEK	5,339	874,679	164	106.7%	122.3%	7.5%
Shanghai, PVG-Shenyang, SHE	5,238	870,411	166	521.4%	435.7%	-13.8%
Chongqing, CKG-Shanghai, PVG	5,233	851,662	163	2791.2%	2897.0%	3.7%
Guangzhou, CAN-Haikou, HAK	5,637	850,895	151	20.0%	2.3%	-14.8%
Kunming, KMG-Jinghong, JHG	6,077	835,751	138	85.8%	70.8%	-8.1%
Beijing, PEK-Urumuqi, URC	4,388	828,868	189	296.7%	230.3%	-16.8%
Changsha, CSX-Beijing, PEK	4,734	819,093	173	183.0%	273.2%	31.9%
Guangzhou, CAN-Nanjing, NKG	4,852	790,759	163	316.8%	276.2%	-9.7%
Beijing, PEK-Qingdao, TAO	4,927	784,630	159	207.6%	180.3%	-8.9%
Shanghai, SHA-Qingdao, TAO	4,939	769,522	156	365.9%	330.2%	-7.7%
Guangzhou, CAN-Chongqing, CKG	5,197	756,906	146	199.7%	146.1%	-17.9%
Changchun, CGQ-Beijing, PEK	4,602	759,918	165	137.7%	176.7%	16.4%
Beijing, PEK-Xiamen, XMN	4,432	738,700	167	215.7%	162.9%	-16.7%
Hangzhou, HGH-Shenzhen, SZX	4,600	734,465	160	433.6%	442.1%	1.6%
Chongqing, CKG-Shenzhen, SZX	4,711	728,573	155	417.7%	403.7%	-2.7%
Beijing, PEK-Shanghai, PVG	2,959	722,256	244	17.1%	2.4%	-12.6%
Beijing, PEK-Shenyang, SHE	4,570	719,276	157	65.3%	37.3%	-17.0%
Guangzhou, CAN-Xian, XIY	4,522	715,218	158	261.8%	211.8%	-13.8%
Guangzhou, CAN-Kunming, KMG	4,449	713,563	160	129.4%	94.8%	-15.1%
Shanghai, SHA-Tianjin, TSN	4,787	713,479	149	722.5%	777.7%	6.7%
Guangzhou, CAN-Shenzhen, SZX	4,320	704,439	163	483.8%	347.2%	-23.4%
Chengdu, CTU-Kunming, KMG	4,430	669,620	151	59.0%	52.2%	-4.3%
Changsha, CSX-Shanghai, SHA	3,789	647,685	171	696.0%	874.1%	22.4%
Kunming, KMG-Lijiang, LJG	4,611	638,380	138	194.3%	171.8%	-7.6%
Chongqing, CKG-Kunming, KMG	4,066	621,883	153	154.9%	168.0%	5.1%

similar purpose.

Many other routes have experienced capacity growth from 45% to almost 200% (see table, page 11). In a few cases, such as LHR-PVG, capacity has increased by almost a factor of six.

A typical example is LHR-DEL. Incumbents BA, Virgin and Air India have increased capacity, while Jet Airways and Kingfisher have entered the route. The same is true of LHR-BOM. The growth in capacity is triggered by high traffic growth rates due to the expanding Indian economy, and has been absorbed by an increase in frequencies. Aircraft types have changed from 747s as standard to A330s, A340s and 777s.

FRA-PVG is a similar case, with incumbents adding capacity and services with medium-sized widebodies, while China Eastern has also entered the route.

FRA-PEK has had a 60% increase in capacity, so Lufthansa has upgraded its daily service from a 747 to the A380. Air China has added services with an A330.

Other routes that have seen large increases in capacity include: Moscow (SVO) - PEK, FRA-ICN, CDG-PEK, CDG-ICN, AMS-KUL, FRA-DEL, LHR-PVG, AMS-PEK, LHR-ICN, LHR-PEK and VIE-BKK. These are all mainly related to economic growth in the Asia Pacific area. The vast majority of these routes have seen a higher rate of increase in services and frequencies over the same period, however. Average aircraft size has decreased in most cases, and A340s and 777s account for a higher portion of operations. Only AMS-KUL has increased in aircraft size as Malaysian Airlines has switched from a 777 to a 747. Air India entered the FRA-BOM

route with a 777, increasing aircraft size.

Only four routes that have seen an increase in capacity have an average aircraft size greater than 350 seats.

Seven routes in this market have seen capacity reductions of 13-35%, and in most cases average aircraft size has also fallen (see table, page 11). Three are from LHR, FRA and AMS to NRT, while another two are from ZRH and FRA to BKK, and the other two are AMS-SIN and LHR-KUL. Despite the decline on FRA-NRT, Lufthansa has switched its 747 service to the A380, while JAL and ANA have changed from 747s to 777s.

Other routes have more or less maintained total capacity. Two, from CDG and ZRH to SIN, have A380 services. On CDG-SIN, Air France has maintained its capacity, but Qantas has pulled out of the route. Singapore Airlines has increased its capacity by upgrading to a daily A380 service.

In the case of ZRH-SIN, the failure of Swissair left the route to Singapore Airlines, which has increased its services by 17%. Most are operated by the A380.

Several routes are potential candidates for the A380 or 747-8. One for Air France is CDG-NRT, on which it has 300,000 seats per year. There are several from LHR that include BKK, HKG and KUL. Cathay Pacific has 544,000 seats per year on LHR-HKG, while Thai and Malaysian each have about 290,000 seats annually on each of the others. Two others are FRA-SIN and FRA-BKK, where Singapore Airlines and Thai operate with more than 240,000 seats.

Intra-Asia-Pacific

The intra-Asia-Pacific market can be sub-divided into several groups of routes. The large Japanese, Chinese and Indian domestic markets are examined separately, while the remaining routes are analysed here.

Most routes have enjoyed traffic growth over the past 10 years, and capacity has increased as a result. Routes serving NRT and KIX have seen an reduction in capacity, reflecting the reduction in fifth freedom traffic as airlines have opened non-stop services that bypass Tokyo.

Many routes have seen a large increase in capacity. Of the 60 busiest airport-pairs, 25 have seen at least a doubling of capacity. The top 60 routes overall have seen seat capacity increase by 77%. Despite this, only three of these routes had an average aircraft size of more than 350 seats in 2000, and most routes have seen a reduction in average aircraft size. This is explained by a lot of new entrants entering the market and growing their operations to optimum frequencies. Many of these new entrants have started their services with



narrowbodies, while incumbents have swapped some of their operations with larger widebodies for smaller-gauge types like the A330 and 777. This is even the case with the busiest route, HKG-Taipei (TPE), which has an annual one-way capacity of 4.1 million seats. Even so, this capacity is spread over an average daily frequency of 35 services, many of which are narrowbodies. The same applies to all of the top 10 routes, which all have a larger number of seats than LHR-JFK.

Overall, the total number of services has grown at a faster rate than seat numbers, and average aircraft size has therefore fallen slightly to 207 seats.

There are many airport-pairs in this market that are candidates for ultra-large aircraft. SIN-Melbourne (MEL), SIN-NRT and SIN-SYD are all routes on which the A380 operates, with SIA using it on all three of these sectors. There are many other routes which could potentially use the A380 or 747-8. Examples from ICN include BKK, on which Korean Air has an annual capacity of 262,000 seats. Korean Air's other busy routes from ICN to Fukuoka, Hong Kong, Tokyo, Beijing, Singapore and Osaka.

Singapore Airlines is another airline with several high-density routes in this market. Routes from SIN include Bangkok, Denpasar, Hong Kong, Manila, Beijing, Shanghai and Jakarta.

Thai International has a large number of high-density routes from Bangkok. These include Chiang Mai, Phuket, Hong Kong, Tokyo, Singapore, and Taipei.

Japanese domestic

The Japanese domestic market includes some of the world's busiest

routes. This includes Sapporo (CTS) - Tokyo, Haneda (HND), which is the busiest route in the world with an annual one-way seat capacity of 7.15 million (*see table, page 14*).

The top 40 routes in this market are divided about equally between those that have experienced capacity growth and those that have shrunk. Overall, the capacity on these sectors is little changed from 2000, but frequencies have increased and average aircraft size has reduced by 25% to 240 seats.

The general cause of this is that there are several new entrants to the market, in particular Hokkaido Air System, which has been 51% owned by JAL since 2000. JAL itself has reduced capacity on a large number of routes, but it has also introduced a mix of smaller widebodies and some narrowbodies that it acquired when it bought JAS. Furthermore, in every case where JAL has reduced capacity, ANA has increased capacity. It has also raised frequencies at a higher rate. Frequencies are overall generally higher than in 2000, and average aircraft size has reduced. Only one or two routes have an average aircraft size of more than 350 seats.

Chinese domestic

The Chinese domestic market has had high growth rates over the past decade, with the top 50 routes having all seen large increases in capacity. Collectively, the seat capacity on these airport-pairs has almost tripled. Frequencies have grown at a faster rate, however, so average aircraft size is 7% smaller than it was in 2000.

The large increases in capacity mean that the top 15 routes in this market have

The requirement for the A380 is on routes where airlines based in the Middle East have enjoyed high rates of traffic growth and have limited scope to increase frequencies, and with airlines that maintain a strong position on some of the world's highest density established airport-pairs.

become some of the world's busiest. The busiest airport pair is PEK - Shanghai, Metro (SHA), with a total annual one-way seat capacity of 3.73 million. Airlines have been particularly interested in providing a high number of daily frequencies on each route. Total daily services on many of the busiest sectors have increased from a typical level of five or six to between 20 and 35 services. Most of the capacity on these routes is provided by narrowbodies. If traffic growth continues at the same rate over the next decade then a higher proportion of larger aircraft is likely to be used, since frequencies are reaching optimum levels for the dominant carriers. An example is Air China's operation on the top route, PEK-SHA, where it now provides 12 daily flights, some with the 747-400 and 777-200. It is possible that large aircraft will be used to a greater extent over the coming decade, and that even ultra-large types will be needed on some frequencies at peak times.

Indian domestic

The development of the Indian domestic market has been similar to the Chinese domestic network. Traffic growth rates have been high enough to stimulate an almost tripling of capacity on the top 20 routes. Frequencies have increased almost at the same rate as capacity, so average aircraft size is almost the same as it was in 2000.

The majority of aircraft on these routes are narrowbodies, and airlines have sought to develop their networks to offer the optimum frequencies on each route. Kingfisher is the most notable new entrant in the market, but all carriers are using mainly A320 family and 737NG family models for operations. The exception to this is incumbent Air India. It previously operated a high number of services with widebodies, including the 747. Since 2000 it has switched some of its services to narrowbody operations. Indian Airlines, which was merged into Air India in 2007, has also swapped its A300B4 services for A320 family aircraft over the past 10 years.

The more dominant carriers are operating 5-10 daily services on the busiest routes. This suggests that their frequencies will reach optimum levels over the next 10 years if traffic and capacity growth continues at the same rate as it has for the past decade. Larger

aircraft will then need to be deployed as traffic levels continue to rise.

Ex-Middle East

The Middle East is the third market that has experienced high rates of traffic and capacity growth. Unlike China and India, however, there is only one carrier on long-haul routes from each of the three major hubs. These are Emirates at Dubai (DXB), Etihad at Abu Dhabi and Qatar Airways at Doha. These carriers all work by providing connecting services on long-haul flights via their hubs with schedules that provide connection banks. Unlike other markets, therefore, there is limited scope for high levels of service frequency. Together with a single airline operating services, aircraft gauge on most routes will have to be large. As Hoesch explains, on some routes it is only possible for Emirates to operate daily, and most others have twice-daily operations.

The top 50 long-haul routes from hubs in the Middle East have collectively had an 84% increase in capacity; less than the Chinese and Indian domestic markets. Frequencies have been increased at about the same level, so average aircraft size on most routes is similar to that in 2000. Nevertheless, because of market conditions, there are 12 routes, all to and from DXB, where Emirates currently operates the A380. These are to LHR, BKK, HKG, ICN, CDG, PEK, Jeddah (JED), Manchester (MAN), Sydney (SYD), Auckland (AKL) and Toronto (YYZ).

Most have similar characteristics of Emirates operating twice daily. The A380 is used on one of these daily frequencies, while smaller types are used on the other services. Emirates has plenty of other routes on which it operates multiple frequencies per day. With continued growth many of these routes could absorb daily services with the A380, hence Emirates's large order for a total of 90 aircraft.

With continued growth many of these routes could absorb two daily frequencies with the A380, hence Emirates' large order for a total of 90 aircraft.

Etihad and Qatar Airways also have several routes on which they have high annual capacities from Abu Dhabi and Doha. These are the most obvious candidates for the A380. From Doha these are BKK and LHR, which have annual capacities of 270,000 and 312,000 respectively. Etihad's busiest routes from Abu Dhabi are BKK, CDG, LHR and Manila which have annual seat capacities of 225,000-446,000.

Summary

The past decade has seen several changes in the industry. The first is the

MIDDLE EASTERN CAPACITY DEVELOPMENTS


Route	2010 Annual flights	Annual Seats	Average size -seats	10-year difference -flights	10-year difference -seats	10-year difference -size
Riyadh, RUH-Jeddah, JED	7,576	1,918,379	253	82.3%	59.6%	-12.5%
Dubai, DXB-Doha, DOH	6,079	1,318,889	217	115.6%	166.2%	23.4%
Dubai, DXB-London, LHR	3,662	1,205,402	329	50.7%	81.5%	20.4%
Tehran, THR-Mashhad, MHD	7,048	1,175,294	167	103.6%	107.4%	1.9%
Kuwait City, KWI-Dubai, DXB	6,010	1,153,855	192	248.4%	221.3%	-7.8%
Izmir, ADB-Istanbul, IST	6,970	1,112,040	160	68.2%	50.9%	-10.3%
Bahrain, BAH-Doha, DOH	5,505	993,074	180	101.9%	109.5%	3.8%
Istanbul, IST-Ankara, ESB	5,952	960,027	161	19.1%	16.2%	-2.4%
Jeddah, JED-Cairo, CAI	3,403	938,136	276	44.3%	57.4%	9.1%
Dubai, DXB-Bahrain, BAH	4,849	888,267	183	59.7%	43.2%	-10.4%
Dubai, DXB-Mumbai, BOM	3,618	881,237	244	124.7%	109.3%	-6.9%
Antalya, AYT-Istanbul, IST	4,502	762,997	169	78.9%	85.2%	3.5%
Jeddah, JED-Dammam, DMM	2,838	704,473	248	46.7%	33.9%	-8.7%
Bangkok, BKK-Dubai, DXB	1,822	702,000	385	156.3%	223.5%	26.2%
Dammam, DMM-Jeddah, JED	2,807	698,382	249	44.8%	35.5%	-6.5%
Muscat, MCT-Dubai, DXB	3,626	678,212	187	-13.6%	12.4%	30.1%
Dubai, DXB-Delhi, DEL	2,847	644,647	226	369.0%	329.8%	-8.4%
Dubai, DXB-Karachi, KHI	2,671	628,939	235	6.5%	-3.3%	-9.2%
Bahrain, BAH-Kuwait City, KWI	3,829	617,006	161	202.4%	187.8%	-4.8%
Riyadh, RUH-Dammam, DMM	4,502	613,500	136	65.7%	17.1%	-29.3%
Dubai, DXB-Muscat, MCT	3,171	608,166	192	-22.1%	6.0%	36.1%
Larnaca, LCA-Athens, ATH	3,692	575,319	156	81.2%	61.1%	-11.1%
Abu Dhabi, AUH-Bahrain, BAH	3,638	548,411	151	92.0%	75.1%	-8.8%
Abu Dhabi, AUH-Muscat, MCT	3,330	531,182	160	60.5%	47.5%	-8.1%
Tehran, THR-Shiraz, SYZ	3,755	506,070	135	77.5%	48.2%	-16.5%
Dubai, DXB-Singapore, SIN	1,443	498,571	346	52.7%	61.9%	6.0%
Dubai, DXB-Beirut, BEY	2,357	488,148	207	290.2%	314.2%	6.2%
Abu Dhabi, AUH-Doha, DOH	3,259	483,995	149	61.3%	51.7%	-5.9%
Muscat, MCT-Abu Dhabi, AUH	2,988	481,443	161	25.4%	27.6%	1.8%
Tehran, THR-Ahwaz, AWZ	2,815	481,438	171	79.6%	73.6%	-3.4%
Dubai, DXB-Cairo, CAI	1,590	479,782	302	119.9%	137.6%	8.0%
Dammam, DMM-Riyadh, RUH	4,075	471,775	116	48.6%	-11.3%	-40.3%
Dubai, DXB-Kuala Lumpur, KUL	1,397	459,356	329	395.4%	466.9%	14.4%
Riyadh, RUH-Cairo, CAI	1,811	455,903	252	93.7%	81.0%	-6.5%
Istanbul, IST-London, LHR	2,422	453,877	187	25.4%	25.2%	-0.2%
Dubai, DXB-Kabul, KBL	2,903	453,810	156	8194.3%	6760.3%	-17.3%
Dubai, DXB-Colombo, CMB	1,523	450,015	295	94.5%	110.0%	8.0%
Doha, DOH-London, LHR	1,460	446,026	305	216.0%	347.2%	41.5%
Dubai, DXB-Paris, CDG	1,173	441,722	377	35.1%	138.0%	76.1%
Kuwait City, KWI-Cairo, CAI	2,264	439,621	194	115.2%	77.6%	-17.5%
Dubai, DXB-Amman, AMM	2,027	432,303	213	278.9%	321.8%	11.3%
Dubai, DXB-Chennai, MAA	1,825	431,800	237	931.1%	786.3%	-14.0%
Shiraz, SYZ-Tehran, THR	3,253	427,528	131	53.7%	25.7%	-18.2%
Dubai, DXB-Riyadh, RUH	1,573	426,543	271	200.8%	162.9%	-12.6%
Dubai, DXB-Dhaka, DAC	1,470	425,329	289	214.8%	161.3%	-17.0%

emergence of the Middle East as a main long-haul market, and the Chinese and Indian domestic networks as major air transport markets. The second is the increased levels of competition on many routes and in many markets, either directly from competing airlines, or indirectly by the opening of new routes. Examples of indirect competition are the Middle Eastern carriers' long-haul networks on the non-stop services between Europe and the Asia Pacific, and the opening of direct non-stop trans-Pacific routes on many of JAL's international routes.

This second main change has led to a general downsizing of aircraft sizes by most airlines on most routes.

The need for ultra-large aircraft has therefore not materialised due to continued growth on a large number of

established routes from incumbent airlines. In the case of A380 airline customers, with the exception of the three carriers based in the Middle East, the need for ultra-large aircraft has arisen on the busiest routes where the airline has a major presence, or when it has taken advantage of a competitor leaving the route.

In the case of Middle Eastern operators, the use of major hubs for long-haul connecting services limits them to twice-daily services on most routes. Combined with high rates of traffic growth, these airlines clearly need large aircraft to match demand. 

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