

Average aircraft size across the Atlantic exceeds the 767-300's capacity. High load factors and market maturity all indicate airlines will be forced to increase aircraft size over the next 15 years.

Market maturity points to larger aircraft for the transatlantic

The transatlantic market has been stable for several years, with few new routes being opened. This may indicate the transatlantic is approaching maturity following fragmentation. Routes that can support direct service are already operated, with smaller markets still some way from growing to a viable level.

Carriers are more focused on frequency and capacity issues on their existing transatlantic routes, than opening new ones. Fragmentation of the transatlantic was initiated by the 767, which began to replace the 747 from the mid 1980s. This development has been continued by the A330, A340 and 777.

The 747 is now only used on high density routes, with airlines preferring to use smaller aircraft wherever possible. Projections on the future growth of transatlantic markets suggest that the current average aircraft size will need to increase. Airlines are generally purchasing aircraft that are slightly larger than 767s, which now are insufficient to satisfy market requirements.

The transatlantic market is important for US and European airlines, as evidenced by the amount of available seat-kilometres (ASKs) deployed. It accounts for 37% of North American airlines' total widebody ASKs, and for 48% of widebody ASKs for European operators. Combined, the transatlantic market accounts for 43% of widebody ASKs by these two airline groups.

The importance of the transatlantic to European carriers can be seen in the higher percentage of total airline

widebody ASKs that are deployed on these routes. Despite only six US airlines operating transatlantic routes compared to Europe's 14, the European carriers only offer 850 more seats per day.

With the development of new routes currently limited, short-term growth on the transatlantic will primarily occur on existing routes. Airlines will either seek increased size or frequency. With congestion issues at major airports it is probable that airlines will now seek to increase capacity as an initial offset to accommodate projected growth. To meet demand carriers will therefore need to operate larger aircraft. This will trigger a wave of higher capacity aircraft orders, or the firming of options, to allow demand to be met.

Capacity

The impact of the 767 on transatlantic operations has been significant. Previously carriers used large aircraft to fly between hubs, since it was the only economic way of filling them.

The arrival of 180-220 seat aircraft like the 767 and A310 changed that, allowing airlines to operate to smaller markets. Pan Am used the A310-200 to fly routes to Paris, Frankfurt and Madrid, since the lower seating volume made operations economic and allowed an increase of frequency. United, Delta, American and Continental all followed similar strategies. The 747 is too large for all but the most efficient hub carriers, and most airlines found it too big for transatlantic operations.



This was exacerbated with the provision of fifth freedom traffic rights to many carriers operating between Europe and the US to other destinations. Air New Zealand, Air India, Singapore Airlines, Kuwait Airways, Royal Jordanian, Pakistan, Ethiopian and El Al all operate transatlantic services, and compete for passengers, thereby reducing the volume of passengers available for US and European airlines.

A further effect on the market occurs because those carriers are mostly carrying passengers to their home market, and attempt to pick up transatlantic passengers to fill otherwise empty seats. Their fares are subsequently lower than established carriers'.

The high level of competition, combined with demand from smaller centres for non-stop service, dictated optimal aircraft size. The open skies accord, combined with economic aircraft, allowed the market to fragment away from major gateways, which has resulted in passenger total volumes increasing. The increase in frequency and number of routes reduced the volume of passengers per departure. Smaller aircraft size protected carriers from the worst effects of fragmentation. The decrease in aircraft size was then followed by an increase in aircraft size on some routes with continued traffic growth. Airlines reverted to larger aircraft in the latter part of the 1990s to cater for the underlying natural demand, replacing 767 services with 777s and A340s.

Different carriers have pursued different strategies on the transatlantic,



United has one of the largest average aircraft sizes on the transatlantic of US carriers. The average size of aircraft now exceeds the 767-300. Load factors, flight frequencies and number of city-pairs served have reached the level where the majority of further traffic growth will have to be accommodated by increased aircraft size. While United and others replaced 747s with smaller 777s in the past five to eight years, average aircraft size will have to increase again. Predictions are this will be equivalent to the A340-600, 777-300 and 747 in 15 years.

focusing on either higher frequency with fewer seats per departure, or having lower frequency but offering higher seat volume. An example can be provided by British Airways (BA) and Virgin. BA has four daily frequencies between Boston and London, while Virgin has one. BA uses 777s and 747s, averaging 340 seats per departure. Virgin operates a 747 with 440 seats per departure. By examining capacity data for transatlantic services, it is possible to see the different strategies employed by airlines.

“Mindful of the continuing slot shortage at London Heathrow (LHR), we do not look at ‘frequency growth’ per sector, and concentrate more on total ASKs and the effect that additions to our flying have on total unit costs and unit revenues,” says Willy Boulter, director of commercial planning and strategy at Virgin Atlantic Airways. “Obviously, transitioning our LHR Airbus fleet from the A340-300 to the A340-600 is a benefit in terms of reduced seat-mile costs, and we hope this will continue as we take delivery of the A380s from 2006. We also support 100% the initiative to build a third runway at LHR, since this will be a key part of any drive to relieve congestion at London airports.”

The number of departures and seats, both daily and yearly, for all carriers that offer at least a daily frequency is shown (see table, page 16). The average aircraft size for the carriers shown is about 255 seats, and load factor is 81.6%. Average size has to be taken into consideration with a few fifth freedom carriers such as Air India, Singapore Airlines and Air

New Zealand operating 747s with high-density seat configurations.

The European airlines have an average seat size per departure of 272, while US carriers have an average seat capacity of 233.

BA has the highest number of departures with 42 per day. Average seats per departure of 270 (see table, page 16) also make BA one of the larger carriers. This shows the reliance that BA has on the 747 and 777.

American, the second largest carrier by frequency, offers 39 daily flights but has an average of 210 seats per departure (see table, page 16). Both American and Delta’s high volume of departures but lower average seats shows that these airlines use smaller aircraft. Delta’s largest aircraft is the MD-11, while American uses 767s and 777s. Neither carrier has ever purchased 747s.

Of the European carriers, Lufthansa, Air France, and Virgin all have higher average seat capacities, but lower departure volumes. These carriers appear to favour capacity over frequency. They currently operate a mix of 777s, A340s and 747s, and are also customers for the A380. This suggests that their future fleet strategy will continue to be based around fewer departures and high capacity.

European airlines generally have larger aircraft than their US counterparts, a trend observed in a previous analysis of this market (see *Transatlantic ready again for large aircraft, Aircraft Commerce, May/June 1999, page 27*). The disparity in size can be partially explained by the fact that carriers like American, Delta,

and US Airways are late entrants to the transatlantic.

US Airways, for example, has a small number of routes and until recently only operated the 767-200/-300. Northwest, which currently operates DC-10s on its routes to Amsterdam, London, and Paris will probably use its A330s on the routes, maintaining its seat capacity. The trend toward selecting medium-capacity aircraft has also been followed in Europe, with Aer Lingus and Alitalia removing their 747s in favour of A330s and 777s.

Passenger growth

Currently the transatlantic has overcapacity, with most airlines offering deep discounts to fill otherwise empty seats. Airlines have generally matched demand to capacity to reduce the risk of flying oversized aircraft and to enable a balance between supply and demand.

As economic growth resumes, airlines may be unable to meet the passenger growth forecasted without requiring larger aircraft. Yearly passenger volume and load-factor for each airline is shown (see table, page 16). Seven airlines have load factors above 85%, suggesting that high levels of spill already occur. Only seven airlines have load factors below 80%. This suggests that carriers will be able to absorb only a small amount of the projected growth within their current fleet and schedule structure.

While the table shows that airlines have been successful in mapping demand and capacity to generate such high loads in the current market environment, it also

ANNUAL EUROPE-UNITED STATES TRANSATLANTIC TRAFFIC & CAPACITY DATA

Airline	Departures per year	Departures per day	Passengers per year	Seats per year	Seats per departure	Load factor %
BA	15,123	42	3,071,391	4,094,756	270	75.0%
AA	13,885	38	2,350,449	2,907,492	210	80.8%
DL	13,854	38	2,532,078	3,066,646	222	82.6%
UA	11,556	32	2,251,941	2,833,573	245	79.5%
LH	9,232	25	2,206,662	2,597,247	281	85.0%
CO	8,404	23	1,526,335	1,904,168	227	80.2%
AF	7,661	21	1,675,371	2,023,704	264	82.8%
NW	6,161	17	1,544,244	1,807,919	293	85.4%
VS	5,363	15	1,689,060	1,946,663	363	86.8%
US	5,188	14	1,029,919	1,223,116	236	84.2%
KL	2,893	8	698,954	825,812	283	84.6%
SK	2,781	8	515,958	605,795	218	85.2%
AZ	2,459	7	429,760	538,171	217	79.9%
EI	1,934	5	503,699	583,553	302	86.3%
LX	1,456	4	258,930	306,766	210	84.4%
FI	1,394	4	216,061	264,188	190	81.8%
IB	1,339	4	341,489	424,464	314	80.5%
LO	957	3	183,688	207,362	219	88.6%
SR	924	3	158,509	193,396	204	82.0%
OS	810	2	172,542	209,790	261	82.2%
SU	802	2	135,324	175,055	218	77.3%
BD	671	2	105,475	163,724	249	64.4%
AI	604	2	202,102	262,740	450	76.9%
SQ	559	2	147,444	207,711	356	71.0%
TP	550	2	109,241	127,546	218	85.6%
NZ	419	1	138,407	163,971	374	84.4%
Total	231,574	321	47,766,789	58,521,684	255	81.6%

shows that they require more aircraft to cater for future demand.

Boeing and Airbus predict an identical growth forecast for the transatlantic of 4.1% per year, while the International Air Transport Association (IATA) is slightly more aggressive at 5.8%. The Boeing/Airbus forecast and extrapolation over the next 10-15 years shows a significant change in the overall market size. The compound growth over a 10-year period is 48%, and 80% for a 15-year period. This means that the current passenger volume of about 24 million passengers per year will grow to 35 million passengers in 10 years, and 43 million passengers in 15.

Passenger volume may also be influenced by the political environment, especially bilateral restrictions. With bilateral restrictions removed growth may increase above the 4.1% predicted by Boeing and Airbus. Industry analysts speculate that a fully deregulated market may allow the transatlantic to meet or exceed the 5.8% growth predicted by IATA. This would place it among the highest growth regions, something that analysts believe is reasonable considering the size and inter-dependence of the economies of North America and Europe.

“Bilateral development is difficult to predict, as the political complexities make this a very uncertain area,” says Vinay

Dube, vice president at Sabre Airline Solutions. “Over the short term this will not be resolved but in a medium-term context (15 years), the market dynamics of free-market economics and globalisation should see bilaterals removed. In a purely economic format, bilaterals are a form of protection, and protectionist policies do not promote strong economies. Free market economics will promote change, and the development of globalised markets will speed this change.” If the growth levels predicted by IATA occur, airlines will need an average aircraft size of 371 seats per departure in 10 years to meet demand.

However, this is unlikely to occur, because airlines will add frequency and routes. It is, however, a useful measure to determine how much growth the market can currently accommodate. While airlines will develop new routes and increase frequency on existing services, these options may be limited.

Congestion issues in Europe may hamper some airlines, with BA and Virgin potentially the worst affected because they are based at Heathrow airport. This prevents further frequencies being introduced, because all Heathrow slots are now taken. The primary option for these carriers is to utilise larger capacity aircraft, evidenced by Virgin’s purchase of A340-600s and A380s. “We are pursuing

both route thickening and new route development,” says Boulter. “We keep our options open and are guided more pragmatically than any ‘long-term strategy’. In fact, while we must all do five or 10 year planning, I sometimes wonder if there is such a thing as ‘long-term strategy’ in the airline business!”

Carriers like Air France and Lufthansa, both A380 customers, will be able to meet demand with a combination of frequency and capacity increases.

US-based airlines are mostly purchasing 777s and A330s, and none have placed orders for the A380. With the exception of United and Northwest, the other US carriers do not have access to 747s, suggesting they may be candidates for larger aircraft in the future.

It is possible to approximate how many aircraft will be required on the transatlantic by analysing the current volume of daily departures. Scheduling transatlantic sectors is relatively straightforward, because aircraft can do one return flight every 24 hours on most routes. Most sectors require one aircraft.

The number of daily departures is 321 (see table, this page). This equates to 160 aircraft used daily for operations. To accommodate the forecast passenger demand in 10 years, assuming the current average seating does not alter and no new routes are added, the market will require 222 aircraft. As new routes are introduced this number could grow to 265 aircraft, 100 aircraft more than currently used. Retirement of older aircraft will play a role, as carriers like Northwest, Alitalia and Delta replace their fleets. Analysts believe that when retirements are included the volume of new aircraft required for transatlantic operations could exceed 140 over the next 12 years.

Market development

Analysis of Boeing’s aircraft demand forecast shows that the large aircraft market is only 11.8% of the total widebody market. This corresponds with its belief in continued global market fragmentation. Fragmentation has slowed in recent years, as markets able to sustain direct services already have them. BA has tried several times to make routes like London-Portland or -Salt Lake City sustainable, only to exit the market.

Passengers from these and similar markets are instead carried on connecting services through a hub. Economic growth will eventually enable more markets to sustain non-stop service, removing those passengers from existing services.

To cater for increased passenger demand airlines have the usual problem of determining which option to select: frequency or capacity.

Increased frequency is not an option

POTENTIAL PASSENGER VOLUMES OF UNSERVED NON-STOP TRANSATLANTIC ROUTES

City-pair	Predicted number of daily passengers	Still-air distance kilometres
DUS-IAD	66	6,357
ARN-JFK	64	6,273
CLT-LHR	63	6,386
CDG-DEN	62	7,808
BRU-LAX	62	9,023
FRA-TPA	61	7,710
DUS-JFK	60	5,998
CDG-MCO	59	7,211
LHR-SDQ	59	6,949
CPH-JFK	58	6,168
CDG-PIT	56	6,256
MAD-SFO	55	9,299
SFK-TXL	54	6,348
FCO-LAS	49	10,166
FCO-MIA	49	8,296

for some carriers restricted by congested hubs and they have already made a move to large aircraft. Other carriers do have some options, and will determine the optimal solution based on customer demand. "There are valid points for both frequency and capacity increases," says Vinay Dube, vice president at Sabre "From a customer preference perspective more frequencies are superior. This is not possible, however, during periods where there are already heavy service levels. The economics of flying nose-to-tail flights to meet the demand for a certain departure period has less appeal than using a larger aircraft. Airlines will meet the market demands with a mixture of both capacity and frequency; adding frequency to the routes first where possible, but placing large aircraft on popular services where significant spill is occurring."

Significant spill is occurring at the airlines' major gateways, for example Chicago-London. While this is partly a cause of the hub structure, it is also a reflection of the size of the cities themselves. Chicago-London, for example, has an average of 740 passengers per day flying that city-pair. Based on the manufacturer's growth rate, this will increase to 1,050 in 10 years. If the IATA forecast is used it becomes 1,230. With Chicago and London already congested, increased aircraft size is the only realistic solution.

Fleet orders

Carriers are already beginning to increase their capacity, as evidenced by recent orders. KLM has ordered 747 Combi and 777s, Alitalia ordered 777-300s, Lufthansa has A380s on order, Virgin is taking delivery of A340-600s, A380s and 747-400s, while Swiss has ordered A340-600s/-300s.

Alitalia and Swiss are using the aircraft as partial replacement of their 767/MD-11/747-200 fleets, while other carriers are using the new aircraft primarily for fleet/capacity growth. A similar story is occurring in the US, where Northwest has ordered A330-300s, Delta has 777-300s and 767-400s on order, and Continental has 777-200s.

Orders by airlines like Delta, Continental and Northwest are tending towards replacement of older models. Delta currently has MD-11s, while Northwest has DC-10s. Continental has already replaced its DC-10s with 777s.

Following a similar trend in Europe, Swiss is replacing its MD-11 fleet, while Alitalia is replacing its 747s and MD-11s.

Iberia ordered A340s to supplement its existing fleet and as partial replacement of 747s.

Most airlines are moving away from 747s, favouring types with 260 to 340 seats. Industry analysts believe that the optimal aircraft size for future transatlantic routes will be within this bandwidth, while smaller aircraft will be used for route development. This makes the A340, A330, and 777 primary contenders for new orders, with the A380 having only a limited place.

With predicted traffic growth, aircraft will need to grow from an average size of about 255 seats to 360 seats in the next 15 years. An increase in passenger load factor would reduce the need to increase aircraft size by this amount, but this is not as likely considering the already high load factors airlines have.

Smaller carriers with fewer daily frequencies may absorb some of this growth. With the option for frequency increases being limited, airlines will need to increase capacity to meet demand. Only a few routes will require the A380, since most will require aircraft the size of

the A340, 777-200 and 777-300. More will also start to require the 747 again.

New route development

The effect of new route development on transatlantic passenger volumes is difficult to determine. New routes will be launched, thereby diverting traffic from high-density sectors and hubs.

Analysts believe smaller markets will be developed because of congestion at major European and US gateways. These new routes will be between secondary cities on both sides of the Atlantic.

A forecasting analysis of the major city-pairs that do not have non-stop services to Europe reveals the number of passengers flying between these cities. The top 15 city-pairs (see table, this page) are between 46 and 66 daily passengers. Based on the manufacturers' growth rate of 4.1%, the largest markets will only exceed 100 daily passengers in 15 years.

The data shows that there are a lot of unserved markets with potential for development. For the purposes of this analysis *Aircraft Commerce* removed those routes that are operated by charter carriers or routes that previously had service, like Rome-Chicago.

The top 15 routes are displayed, although there more than 400 routes with passenger volumes between 40 and 60 passengers per day. The routes in the table have an average distance of 7,600 kilometres, which is within range of all potential aircraft types without any payload limitation.

The other point to note with the data is that the traffic volumes generally involve at least one congested hub, with the possible exception of Rome (FCO).

Airlines will have to find departure and arrival slots to service this market, or ignore it and carry it over a connection point. This may be likely because there are hundreds of competing routes.

The volume of potential routes, combined with pre-existing congestion issues, suggests that fragmentation opportunities on the transatlantic are limited, and aircraft size increases will be required to service existing gateways.

The volume of unserved markets suggests that while they are currently unable to sustain non-stop service, they may become viable in 10-15 years. These markets are already valuable in providing feeder traffic to hub carriers. No long-haul market is capable of sustaining traffic purely on a point-to-point basis, and carriers require 6th freedom traffic to maximise demand.

The transatlantic is a vital provider of connecting traffic for European airlines' services to the Middle East and Asia Pacific. Carriers like KLM and Swiss rely on connecting traffic through their hubs because their local markets are too small.



Removing this traffic will seriously weaken connection-reliant airlines. Connecting traffic is generally lower yield than point-to-point traffic, increasing reliance on the management of cost and the use of efficient aircraft. “The transatlantic will continue to grow, and it will remain profitable for most airlines, both as a contributor to 6th freedom of traffic and as point-to-point,” says Dube. “The traffic volumes and yields are within a sustainable range with the reduced cost bases that many airlines have. As a general rule sixth freedom of traffic does not contribute significant revenue volumes; it just fills planes. Point-to-point traffic has a considerably better revenue profile, and airlines will favour that above connecting traffic.”

Operating economics

In the past three to four years transatlantic yields have dropped substantially. The transatlantic was previously economic for airlines, partially due to the high volumes of premium traffic available. Airlines have lost money on their transatlantic services with the economic slowdown. Often hardest hit are those airlines with a higher reliance on premium contribution. The capacity exposure of some airlines on the transatlantic is reduced somewhat by deep discounting to fill empty seats. While this improves load-factor it reduces revenue. Unless an airline has an efficient cost structure, operations may continue to be unprofitable.

“We are comfortable with growth numbers of about 4%, although doubtless there will be the usual fluctuations. For us, the more interesting figure will be the related capacity growth,

and consequent development in yields,” says Boulter. “Selling tickets to New York at a net fare to the airlines of about £50 one way, which is what we routinely do at certain times of the year, is neither sensible or sustainable.”

Assuming airlines are already efficient, and the current restructuring at American, United, British Airways, US Airways, and Air Canada suggests that this is the case, the sustainability level for lower yields is critical. To sustain lower yields and generate profit requires aircraft with lower seat-costs. Fuel, maintenance, flightcrew and aircraft ownership costs are the largest cost drivers.

The overhead cost has been offset to a degree by the concessions gained by US carriers, and the restructuring carried out by their European counterparts.

Modern Boeing and Airbus aircraft are similar in terms of operating costs, maintenance requirements, and fuel burn. The only significant difference is the cost incurred by operating four engines (A340) as opposed to two (A330, 777).

Each aircraft has positives and negatives. The biggest consideration influencing selection is financing options and the revenue generation capability of each aircraft type. Most of the aircraft will not incur a payload limitation when flying transatlantic routes.

While larger aircraft are able to carry more passengers, they require more passengers than their smaller rivals to break even. This may create problems if airlines operating larger aircraft have to offer aggressive fares to fill seats, especially during periods of low demand.

Larger aircraft are generally preferred though, as their purchase price is not significantly higher than their smaller rivals’. The A340-600 for example has

Like all other European airlines, Lufthansa’s average seat size across the Atlantic is larger than US airlines. Congestion at major airports means European airlines are limited in their ability to raise frequencies. Traffic growth means these carriers will be forced to increase average aircraft size, and they are likely candidates for aircraft sized between the A340-600 and A380.

about a 5.6% higher operating cost (excluding ownership) than the A340-300 while providing 70-80 more seats and significantly more freight volume.

If yields have been reset to a lower level airlines will require aircraft with a lower operating cost per seat to combat this trend. This may then result in airlines flying larger aircraft to carry as many passengers as possible, but may then place further pressure on yields as airlines have to cut prices to fill seats. The one problem, however, is that new aircraft have high financing costs. Airlines will therefore need to try to increase yields where possible and also maintain tight cost controls to avoid losing money.

Summary

The transatlantic will soon enter another growth phase. The previous capacity level of the 767 is insufficient to meet demand, and airlines will need to increase their capacity to accommodate growth. While frequency will also be increased in some cases, congestion issues limit this option. The trend to downsize aircraft appears close to ending, with some airlines already ordering larger aircraft.

Demand for aircraft is predicted to be strongest in the 270-360 seat range. This range is well catered for with Airbus and Boeing offering the A330/A340 and 777 respectively. The demand for these aircraft is likely to be very high, since they will replace the 767, DC-10, 747-200 and MD-11 fleets currently operated. The 777 is proving a popular aircraft for transatlantic operations, with increased competition coming from the A330-300.

Demand for the 747 and A380 is less certain on the transatlantic, although logic suggests there will be a demand for them. Existing 747 routes may be operated by the A380, while 777/A340 routes may increase to 747 and 777-300 size. Market fragmentation will play a crucial role in determining the overall demand for very large aircraft. If the market continues to fragment, demand for these largest types will be limited to the densest routes. If the market is unable to fragment much further, demand for larger aircraft will be higher. There are several indications the transatlantic has reached maturity and so average aircraft size will increase with traffic growth. **AC**