The Sonic Cruiser has been misinterpreted. Its seat size and range, and the bonus of higher speed, will allow thin, ultra long-haul routes to proliferate. Analysis shows there are a large number of new routes that would support it, and it would not seriously interfere with the A380's market.

Long-haul evolution: A380 or Sonic Cruiser?

Since its launch at the 2001 Paris airshow, the Sonic Cruiser concept has polarised the views of analysts and industry observers. Much of the debate has centred on the concept, and its viability. Many people believe that the Sonic Cruiser or A380 will define the future of air transport. *Aircraft Commerce* takes the view that both have a role in passenger service, and are not mutually exclusive; both aircraft have a role to play in air transport, and neither will make the other redundant.

Market potential

The biggest debate surrounding the Sonic Cruiser centres on whether it will be built. The design has altered several times, leading to industry speculation about Boeing's belief in the project. Walt Gillette, director of the Sonic Cruiser project explains the reasons for the change, and the underlying design principle. "The Sonic Cruiser has been designed to go further and faster than anything we have done before. We redesigned the passenger market with the 747, and we will do it again with the Sonic Cruiser. It will climb out of congested airspace quickly and fly higher than any existing aircraft, so it will not experience en-route delays. It puts a lot of city-pairs in reach that previously were not feasible, because of its range." Gillette also explains the alterations in the concept's design, although these may be interpreted as Boeing's lack of commitment to the project. "We went through the same process of redesigning the 747. We had many variations before it was unveiled. The difference with the Sonic Cruiser is that all these variations are publicised, but do not reflect a lack of commitment to the Sonic Cruiser principle."

The philosophy behind the Sonic Cruiser is that it will overfly congested airports, thereby avoiding crowded airspace. It has a cruise altitude of 40,000 feet, or higher, which will assist the Sonic Cruiser's fuel consumption, predicted by analysts to be high. The Sonic Cruiser has a range potential of up to 10,000nm, allowing it to fly virtually any city-pair in the world.

However, the Sonic Cruiser's long-range benefit may also cause problems. Will passengers want to fly for 14-plus hours to avoid a connection? The route from SYD/AKL-LHR, two of the longest in the world, have a stop in SIN or LAX respectively, thereby allowing passengers to break their journey, and reduce the amount of aircraft fatigue. Currently the longest non-stop flight is Continental's EWR-HKG service, a distance of 8,060nm and a journey time of 15:40 hours. United had a similar service, which it cancelled. Many factors contributed to this; one of which was the limited appeal of being airborne for so long, especially for economy travellers. With the heightened profile given to deep vein thrombosis, and the public's perception of economy seating having a causal effect, there may be limits to the distance/time people are willing to fly.

The Sonic Cruiser will obviously reduce the flight time: a journey that will take 14 hours in a Sonic Cruiser would take 17.5 in a conventional aircraft. Encouraging people to fly those long distances non-stop may be difficult, and may limit the airline's ability to charge a premium for the service.

Aircraft rationales

The A380 is designed to operate on existing and future high-density routes that are currently served by 747s. These routes include Singapore, Bangkok, Hong Kong, Tokyo, and Los Angeles to Europe and the US. These routes already have high frequency, and the scheduling window often compresses any new flights close to existing services. Operating two widebodies close to each other is not appealing from a planning or market segmentation perspective, especially on traditionally low-yield routes where operating margins are thin.

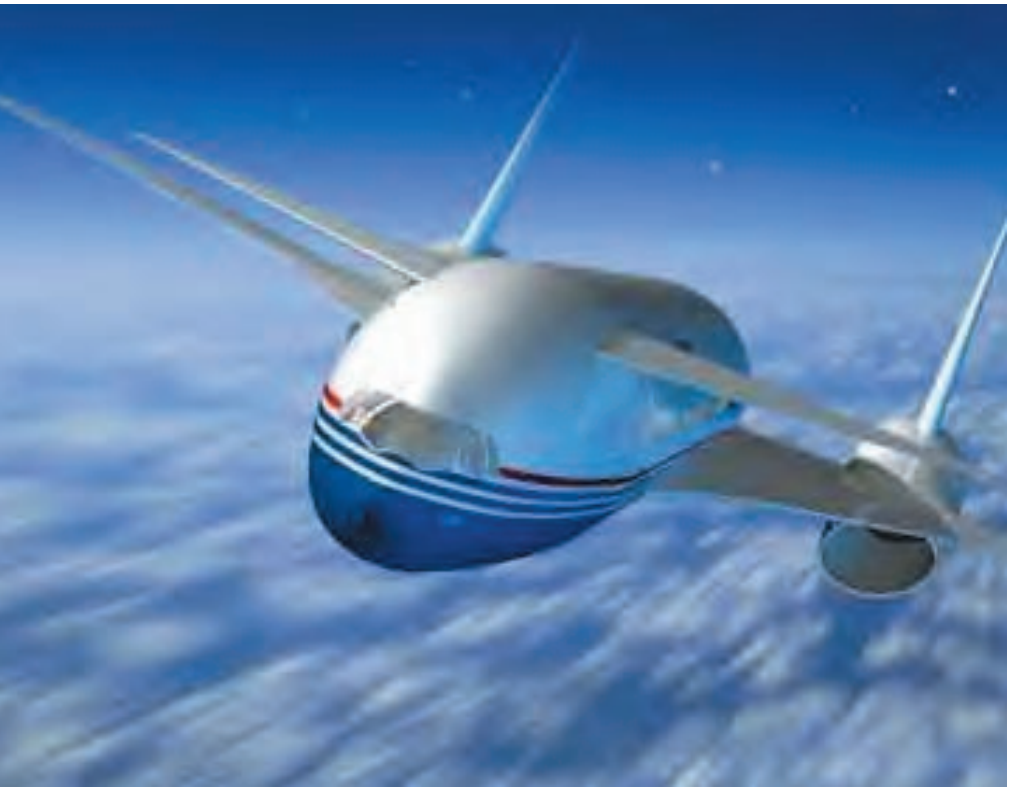
A solution is to use one A380, secure the majority of the passengers, and benefit from one aircraft trip cost to offset the lower yield. An example of this potential is South African Airways, which operates two 747s to depart from JNB to LHR with a 30-minute separation. The airline is unable to send an aircraft earlier, since it would arrive during curfew hours. Two 747s are required to satisfy demand.

The Sonic Cruiser is designed for a different set of market dynamics. It is mostly equated with the same market types as those served by Concorde: i.e. time-sensitive, short sectors providing high yields. These types of routes are mostly transatlantic. Boeing has not designed the Sonic Cruiser to compete with Concorde; but positioned it to further fragment connecting traffic passing through long-haul hubs towards a larger number of non-stop routes. This was a process begun by the 767. The channelling of traffic through long-haul hubs underpins the A380 concept.

This will only happen if Boeing is able to meet, as it continuously re-iterates that it will, the target cost per seat-mile performance that makes it comparable to current aircraft types.

Market demand

Much has been said by industry analysts and manufacturers about the market demands for the A380 and Sonic Cruiser. Boeing expects more markets to follow the transatlantic trend of traffic



The Sonic Cruiser has the potential to re-design market environment. Its ultra long-range capability means it will open new low volume routes that are uneconomic with conventional aircraft. This places it at the opposite end of the spectrum from the A380. The Sonic Cruiser will develop and service its own route structures and market that will be unique to it.

fragmentation and route proliferation. This will include the fragmentation of trans-Pacific, Europe-Asia, and intra-Asian markets which place more of an emphasis on 777-sized aircraft.

Boeing is aiming the Sonic Cruiser at the long-haul hub-bypass method that has long been proposed, but never really developed, mainly due to a lack of suitable aircraft. More direct routes, and subsequent hub-bypassing, will result in a lower demand for very large aircraft. Boeing forecasts the market demand for 400-seat plus aircraft at 370 units over the next 20 years as a result of traffic fragmentation.

Boeing believes it will re-design travel by offering lower flight times on long-range routes. The overall market trend will mirror the transatlantic, where frequency has become more important than capacity. Many transatlantic routes have experienced an increase in frequency and a decrease in aircraft size. Boeing expects many other routes to follow suit. This will accelerate when bilaterals are re-negotiated to between the US and Asia Pacific. The Sonic Cruiser has been developed to over-fly hubs, and operate very long routes that were previously uneconomic. It is not difficult to find city-pairs that are over 8,000nm apart and have the potential to support 150 people per departure.

Airbus believes there is a need for larger aircraft. Based on the continued growth pattern it estimates the market will require 1,200 units over the next 20 years; 830 more than Boeing's prediction.

Boeing's own growth forecasts over the next 20 years suggest a need for larger aircraft does exist, since passenger growth for various markets is expected to average 4.9% per annum. This level of growth will quickly overtake the airlines' ability to add frequency.

Regional growth will place pressure on those routes that are close to frequency saturation. Capacity will need to rise to sustain this growth, and Airbus' philosophy is to increase aircraft size on existing routes.

Inter-regional growth rates are forecast to be 4-6% per annum. It is difficult to see how this growth can be sustained on some routes without additional aircraft size, as the frequency level is already near maximum. Continued traffic growth could also be relieved by the Sonic Cruiser opening new routes.

Airbus believes that the speed differential offered by the Sonic Cruiser will not, as has been claimed, threaten the sales opportunities for the A380. Airbus' philosophy of increasing capacity to provide more seats per departure has the benefit of adding substantially more passengers for an incremental increase in aircraft trip costs. This benefit is offset by the reduced yields that have to be offered to fill the aircraft, especially during periods of low demand. Singapore Airlines (SIA), for example, could reduce its five daily Singapore-London services to four A380 services, while offering 130 additional seats per day. This would allow SIA to carry all existing passengers, grow its LHR-SIN route by 5.7% per annum, similar to growth forecasts, and save the cost of a 747-400 return trip. If SIA did not capture any additional passengers its load-factor would reduce by 4%.

Route opportunities

Aircraft Commerce analysed the A380's route opportunities in 1999 *(see Where and when the A3XX? Aircraft Commerce, July/August 1999, page 31)*. The routes that underpin the A380 have not changed significantly since that analysis, with the majority of routes influenced by the Asia-Pacific market.

Of the top 50 routes, based on seats, 64% are routes to or from Asia-Pacific cities, 28% are Transatlantic and the remainder are to Australasia *(see table, page 13)*. Other route opportunities include the high density short-haul routes within the Asia-Pacific region, which were excluded from the initial analysis.

Based on two widebody flights per day, the A380 is able to operate 214 current routes where the minimum range is 4,000nm.

The Sonic Cruiser is able to serve a large number of routes that are currently out of range, or have insufficient traffic volumes for most airlines to justify operation. This allows city-pairs from Europe and North America to Asia Pacific and Oceania to be opened. The potential of operating a 200-seat, 7,000nm-plus aircraft to by-pass existing one-stop services would be appealing to many airlines.

The ability of the Sonic Cruiser to operate routes in excess of 8,000nm opens up many potential city-pairs. To determine the market potential a schedule analysis was performed to identify all city-pairs with a distance longer than 6,000nm that do not have non-stop service. Specifying a distance greater than 6,000nm places these routes at the

extreme range of a 767/777, requiring an airline to use the Sonic Cruiser for these longer missions.

By deleting existing non-stop services and combining all possible connecting routes that are served by 200-seat or larger aircraft, there are 890 potential city-pairs that are longer than 6,000nm.

This analysis removed the effect of excessive detours, such as combining a service between Auckland and Buenos Aires which currently connects through Los Angeles. All qualifying city-pairs were then matched to daily passenger data, to determine those routes with the strongest demand.

The total daily passenger data were calculated by combining several data sources that included: industry data, passenger and load factor data, departed passenger statistics, global distribution system and origin and destination data.

The list of potential markets from this analysis was 144. This included routes which are predicted to have a one-way daily passenger volume of 50 or more passengers. This is without any market stimulation effect, which would result when a route is launched. The top 40 routes are shown *(see table, page 16)*.

Connecting traffic was not included in this analysis. The top 30 routes have potential to support a Sonic Cruiser with the current passenger volumes that are being carried on connecting flights. The Sonic Cruiser already has a large enough market to service and could operate these routes effectively, provided cost structure is reasonable.

Most of these routes are served with connecting flights or services with technical stops, but would still be able to support a Sonic Cruiser.

Operating, for example, YYZ-SIN, where the forecast average daily one-way passenger level is 110 *(see table, page 16)*, the Sonic Cruiser would have an immediate load factor of 53%. However, the loss of passenger feed on the LAX-SIN A380 service, as a result of opening the YYZ-SIN route, would result in an expected average load factor decrease of 1.2% on LAX-SIN.

The small loss on the A380-serviced LAX-SIN route is caused by the other one-stop or multiple-stop route options that passengers have between SIN and YYZ. The Sonic Cruiser takes only a few passengers from each option.

There is route potential for both aircraft. The A380 will operate routes that already have high frequency and high capacity. The majority of these routes are based in the Asia Pacific region, with other opportunities available in Africa, the US, and Europe.

The Sonic Cruiser has significant potential as well. It will be able to develop long-range routes that are currently under-served, or are served by

ROUTES WITH SUFFICIENT TRAFFIC VOLUMES TO SUPPORT A380 SERVICES

Sector	Weekly frequency	ASKs per week	Seats per week	Seats per departure
LAX-NRT	98	325,973,749	37,212	380
NRT-SFO	84	255,459,483	31,024	369
LAX-TPE	70	310,909,146	28,455	407
JFK-NRT	77	301,440,973	27,811	361
LHR-SIN	63	265,033,681	24,381	387
ICN-LAX	70	231,682,399	24,122	345
HKG-LHR	63	220,534,223	22,855	363
KUL-LHR	56	233,664,126	22,148	396
FRA-SIN	56	221,914,173	21,616	386
LHR-NRT	56	206,466,367	21,504	384
LAX-SIN	42	240,571,354	17,094	407
BKK-LHR	42	155,545,555	16,296	388
HNL-KIX	42	106,396,342	16,086	383
CDG-NRT	42	155,679,364	16,016	381
FDF-ORY	42	108,948,238	15,918	379
FRA-NRT	42	148,858,528	15,876	378
HKG-SFO	42	175,305,495	15,778	376
HKG-LAX	42	182,771,424	15,694	374
KUL-SYD	42	98,939,159	14,966	356
HAV-MAD	42	109,722,444	14,700	350
NRT-ORD	42	146,800,526	14,560	347
SFO-SIN	42	190,836,777	14,070	335
HKG-YVR	42	137,124,021	13,370	318
SFO-TPE	42	137,534,808	13,230	315
NRT-SEA	35	100,636,840	13,132	375
BKK-SYD	35	91,061,015	12,110	346
DTW-NRT	28	116,008,302	11,284	403
BKK-FRA	28	99,042,784	11,046	395
HKG-JFK	28	143,107,034	11,039	394
FRA-HKG	28	101,071,913	11,018	394
HKG-SYD	28	72,082,333	9,814	351
TPE-YVR	28	91,493,019	9,534	341
JNB-LHR	49	154,697,294	17,129	350
LHR-SYD	35	228,417,254	13,734	392
FRA-JNB	28	88,352,752	10,220	365
LAX-LHR	91	271,296,039	30,940	340
LHR-SFO	63	172,271,509	19,971	317
ATL-CDG	56	114,582,246	16,226	290
ATL-LGW	56	102,933,914	15,148	271
FRA-IAD	42	87,421,522	13,328	317
FRA-ORD	42	93,043,138	13,328	317
FRA-LAX	35	122,537,343	13,132	375
LGW-MCO	35	85,840,207	12,271	351
IAH-LGW	42	91,175,824	11,690	278
MAD-MIA	28	81,622,231	11,480	410
LHR-MIA	28	79,845,732	11,228	401
AMS-MSP	28	74,979,866	11,200	400
CDG-SFO	28	86,168,506	9,604	343
LAX-SYD	42	179,064,170	14,882	354

TOP 40 POTENTIAL SONIC CRUISER ROUTES-BASED ON ESTIMATED PASSENGER NUMBERS

SECTOR	Average daily one-way passengers	Great circle distance (nm)
LHR-SYD	556	10,349
HKG-YYZ	353	7,805
LAX-SGN	329	8,165
LHR-MEL	300	10,297
AKL-LHR	296	10,848
HKG-JFK	261	8,067
LHR-PER	232	8,988
BOM-JFK	213	7,797
BNE-LHR	195	10,125
DEL-YYZ	184	7,246
LAX-SIN	169	8,758
DPS-FRA	166	7,415
DEL-JFK	165	7,317
SFO-SIN	156	8,440
JFK-MNL	156	8,513
LHR-MNL	138	6,699
KUL-LAX	135	8,783
SFO-SGN	134	7,837
DUR-LHR	133	5,922
ATL-HNL	126	4,502
BKK-SFO	118	7,925
AKL-BKK	116	5,951
DEL-SFO	114	7,706
MAN-SIN	111	6,810
DEL-YVR	111	6,935
LAX-MXP	111	6,039
SIN-YYZ	110	8,090
BOS-HNL	109	5,095
AMS-CGK	108	7,054
CPT-FRA	108	5,814
HKG-MAN	105	5,997
HNL-IAD	105	4,817
CDG-HAN	105	5,713
AMS-DPS	101	7,553
DEN-LHR	100	4,671
EZE-MEX	99	4,584
HNL-JFK	99	4,983
AMS-CPT	99	5,997
LAX-TLV	98	7,573
LAS-LHR	97	5,230
BOS-NRT	96	6,702
FRA-SYD	94	10,100

one-stop services, and capture the majority of traffic on those routes. The Sonic Cruiser would be able to develop markets that other aircraft would be unable to service which indicates it will not interfere with the A380's market.

Route development

In addition to routes that could currently support the A380 and Sonic Cruiser, routes that could support these aircraft in the future should also be analysed.

To be viable, the A380 needs to be placed on routes where the daily traffic volume exceeds 1,000 passengers. It is probable that airlines will seek volume ahead of yield. The problem with the A380 is that lower fares must be offered to fill it. This is not difficult on some routes. Thai and SIA already operate three to five flights per day to/from London. However, these are already low-yield routes. It is probable that the yield on most A380 routes will decrease from their current levels.

The Sonic Cruiser is likely to be used on two route types: existing, time-sensitive, routes that can produce high-yield passengers; and new routes which are currently served with connections or technical stops. Existing time-sensitive routes include FRA-JFK, LAX-TPE, LHR-LAX, and all others that share similar features of high-frequency and a large volume of premium yield passengers that would probably move to the Sonic Cruiser. Flying the Sonic Cruiser on these routes would reduce journey time by an average of two hours.

However, the Sonic Cruiser's greater benefit to airlines may be opening new routes. Current routes that are served by interline connections may not viable as the traffic volume would be too low, but the technical-stop routes would be viable. These routes would include London-Australia, US-Asia Pacific, and US-Middle East.

With about 200 seats the Sonic Cruiser is in a similar group to the 767 as an aircraft able to perform long-haul route launch/development. Seat-mile cost is not available for the Sonic Cruiser, but Boeing has always maintained it will have comparable cost to their existing family. If this is achieved the Sonic Cruiser will be viable for route development.

With a small seat configuration risk exposure is less, and airlines will not have to offer price discounts to fill seats. They may even be able to charge more because they have the non-stop monopoly. The aircraft would also reach a break-even point sooner in the route-development process than a larger type like an A340 or 777.

Scheduling

The operating characteristics of the A380 are similar to current types, and so no serious alteration is required to existing scheduling procedures. The A380 is similar in speed to types already in service. The A380 utilisation rate and annual flight hours would therefore be close to the current levels.

The Sonic Cruiser, however, will have a different utilisation profile, depending on whether it operates on existing long-haul routes or is used to develop ultra long-haul routes. In certain circumstances it will be able to generate savings from greater seat-mile productivity.

If it were to operate on existing routes it would have a lower than average utilisation rate. This is because of shorter flight times and possible scheduling windows. Faster flight would actually reduce utilisation hours. The reduction in

The A380 will be used on high-density routes that are currently operated by the largest aircraft and at the highest frequencies. For example, Qantas will deploy the A380 on the Sydney-London route and other selected routes to Asia. The Sonic Cruiser will not erode these markets, because of the low demand on the routes it will open.

flight time on, for example, transatlantic routes is not sufficiently large to allow scheduling of additional daily flights.

Faster flight time may simply force longer turn times because of scheduling difficulties. If, for example, the Sonic Cruiser was to depart LHR for SIN at 22:00, it would arrive at 16:00. If it departed SIN two hours later (18:00), it would arrive at LHR at 01:00; during curfew hours. The Sonic Cruiser would have to leave SIN at 1:30 to avoid the curfew, or leave LHR earlier in the day. A 747 departing at the same time from London would arrive in SIN at 18:05 and depart at 23:20, arriving in LHR at 06:00.

HKG and BKK have similar flight times and requirements, meaning that the Sonic Cruiser would be under-utilised on those routes. The additional speed of the Sonic Cruiser offers no real operational benefit because it has to remain on the ground longer in London or Singapore to make the scheduling window at both airports.

The issue is not as difficult on westbound flights, for example LHR-LAX. The aircraft could depart LHR any time up to 22:00, and still make Los Angeles before midnight. On the return it could leave at any time after 11:00 to arrive at LHR from 06:30, thereby avoiding curfews in both directions. The westbound flights would generally have higher utilisation rates, as the scheduling complexities created by its speed differential are less pronounced. The Sonic Cruiser would probably accrue a significant amount of ground-time waiting for its flight window, unless it was deployed on a ultra long-range route.

Greater scheduling flexibility exists on those routes that currently have a technical stop or are served by connecting flights, since the ultra-long distances involved remove several hurdles. As with westbound flights, the flight time is long enough for the aircraft to depart/arrive without severe curfew concerns. Utilisation, or more appropriately seat-mile productivity, would be increased because reduced flight times means that the number of annual sectors would be higher than a conventional aircraft.

Flying SIN-YYZ (8,100nm) would have a flight time of 15.40 flight hours. This route would provide an average daily utilisation of 14.3 hours per aircraft, based on 340 yearly flight cycles per aircraft, and would require 2.1 aircraft for operation for a daily service. An A340-500 type aircraft would need 2.6 aircraft per day. Calculating the decimal in fleet assignment indicates the efficiency of the Sonic Cruiser. This would be repeated on all routes across a network and a smaller fleet would be required to operate the same number of services.

Fleet compatibility

The Sonic Cruiser and the A380 are not complimentary aircraft; one will not provide traffic to the other, as their missions are quite different. An A380 would be deployed on an airlines highest density routes, while the Sonic Cruiser would be deployed on thin routes beyond the range of existing aircraft. Subsequently, an airline could conceivably operate both types without excessive cannibalisation of one aircraft's traffic by the other's operation. The Sonic Cruiser and A380 would be compatible from a fleet and network planning perspective. Their impact on an existing fleet structure would be completely disparate.

While the Sonic Cruiser's aircraft competitors have not yet been defined it will probably put pressure on the 777-200ER and A340-500. The A380 will cause current 747 operators to retire some of their fleets.

Conclusion

The Sonic Cruiser and A380 are both specialised aircraft. The A380 is designed to provide maximum seating per departure, and will only be used on high density routes. The Sonic Cruiser has been designed for long-range operations, and has the potential to launch new city-pairs that were previously uneconomic. The Sonic Cruiser will inevitably bleed some connecting traffic from the A380.

The Sonic Cruiser led to debate about whether Boeing had prompted a shift in the industry. While Boeing has pushed development to a new level, the industry will not be redesigned around the Sonic Cruiser. Both the A380 and Sonic Cruiser serve market segments that are largely independent of one another.

The hub feeder principle that underpins Airbus' project will remain, since it is the most efficient process for moving passengers. Longer-range aircraft like the Sonic Cruiser, and Airbus' own A340-500, will be used to link city-pairs that previously had a technical stop service. The Sonic Cruiser's seat capacity suggests it would be less risky than a 300-seat plus A340 for developing new routes. The Sonic Cruiser's range and speed allow it to operate without some of the constraints that affect current aircraft.

Launching new long-haul routes may be the Sonic Cruiser's primary role, providing it achieves its cost objectives. If the Sonic Cruiser does have a cost per seat comparable to the 767, as Boeing states it will, the appeal will be high. It may even catalyse route proliferation. AC