The Airbus fly-by-wire group of aircraft has long been criticised for having a gap between the A321 and A330-200. This is served by the A310 and A300-600, which do not have commonalities with other Airbuses. Does this gap seriously handicap the A330-200, or is can it compete on an economic level with the 767-300/-400?

The A330-200 takes on the 767-300/-400

The 200- to 260-seat widebody twin market is global, with almost every major airline in every continent operating the A310, A300, A330-200 or one of three 767 models. The markets for these aircraft vary from shuttle operations on sectors as short as 350nm to long-haul routes longer than 5,500nm. With airlines simplifying fleets, clear fleet-planning decisions must be made between a mixed 767-300/-400 fleet and the A330-200.

Until four years ago, airlines used the A310 and A300-600 or 767-300 to fill the 200-260-seat gap. Both Airbus and Boeing product lines had weaknesses. The Airbus aircraft provided a wider range of seat capacities, but lacked commonalities with other Airbus models. The 767-300 had commonalities with the smaller 767-200 and 757-200, but there was a large seat-capacity gap between the 767-300 and 777-200.

The A330-200 and 767-400 have reduced these weaknesses. Airbus' most noticeable disadvantage is that it still lacks a smaller A330 variant to fill the gap between the A321 and A330-200.

767 & A330-200 markets

There are several roles that the 767-300/-400 and A330-200 can fill, and many aircraft types that they can replace or substitute. The 767-300/-400's and A330-200's economic performance and selection for fleet planning can be considered in isolation, but with commonality with other types an important issue, they also have to be considered in various fleet mixes.

US domestic, and regional operations, (e.g. in Europe) will use the 767 and A330-200 as the largest types on trunk routes at peak traffic periods, and types from the A320 family, the 737, the 757-200/-300, A300-600 and A310 for lower traffic volumes. The majority of routes will be up to 1,200nm. A few, such as trans-continental US routes, will be as long as 2,500nm.

The 767-300/-400 and A330-200 will also be used on regional routes in the Asia-Pacific market. These will vary from 1,800-3,000nm, but longer routes can be up to 4,800nm.

The transatlantic market is the third largest, and has routes in the 3,000-5,500nm range.

The 767-300/-400 and A330-200 will operate alongside all medium- and long-haul aircraft types in these two markets.

There are several other airline requirements which have similar route lengths to these three markets. The 767-300/-400 and A330-200 have become the long-haul workhorse of several Latin American, Middle Eastern and African carriers.

767-300/-400

The 767-300/400 are accompanied by the smaller 767-200. This family provides capacity between 185 and 305 seats, in two- and three-class configurations. The three have the same pilot type rating and also have extensive parts commonality, as well as some engine commonality. Pilot commonality is also extended to the 757-200/-300 with a 'common' type rating. This allows low-cost mixed-fleet flying with these five types, generating savings in pilot transition and recurrent training.

The 767-300 has been particularly successful with nearly 600 units sold. The 767 is the most used aircraft in the north Atlantic and is the mainstay long-haul workhorse for many carriers that do not require larger aircraft. The 767-200 is regarded by many of its operators as irreplaceable.

The 767's weakness is that it does not have commonality with a type larger than the -400. The 777-200 is the next largest type.

A330-200

The A330-200 is the smallest A330 variant. It not only arrived too late to provide a stronger challenge to the 767, but the lack of a smaller variant the same size as the A300-600 or A310 creates a wide commonality gap between the A321 and A330-200. This is a weakness, since pilot commonality is otherwise wide-ranging and allows mixed fleet flying with all other Airbus types. A shortended version of the A330-200, the A330-500, has been proposed to overcome this weakness. This will have a three-class seat capacity in the region of 230, close to the A300-600's size. Interest in this aircraft has been limited.

Regional routes-peaks

The 767 and A330-200 will serve the highest-density or premium routes in US domestic and European regional networks. There are two reasons for using aircraft with the 767's and A330-200's capacity in these markets.

The first is that high-frequency short-haul routes have traffic peaks several times a day. The largest will be in the morning. In most cases this is between 7:30am and 10am. Peaks are stronger on business routes. Airlines experiencing peaks in demand may offer one of two options: multiple flights with smaller types, or a single flight with the 767 or A330.

Airlines in Europe and North America operate narrowbodies mainly from the 737, 757 and A320 families at frequent intervals when passenger demand is

The 767-400 has the advantage of a smaller variant to cater for lower passenger demand. This allows the 767 family to generate higher gross profits than the A330-200 over a broad range of passenger volumes. The 767 is also already established as a medium- and long-haul workhorse with a large number of major airlines.

lower. Examples of airlines that operate this way in Europe and North America are Lufthansa, Swissair, Austrian, United, Delta and American. Many of these airlines use even larger types for higher traffic peaks.

The second reason for operating the 767 or A330-200 is that other routes are either limited or do not require high frequencies. Many of these already operate the A300-600, A310, 757, 767-200 or 767-300. Because of continued traffic growth a larger type is required for the same frequency.

In the case of traffic peaks on the high-frequency routes, the option of using a large type at a single frequency has to be considered against having two or even three flights scheduled close together with smaller aircraft.

Airlines want to avoid passenger spill, and so plan on average load factors in the region of 65-70%. Airlines operating short-haul routes will often configure widebody twins in two classes. In the US this is first and economy class, and business and economy in the rest of the world.

The 767-400 and A330-200 have US two-class seat capacities of 304 and 293 seats respectively. Passenger demand of up to about 210 during this peak will allow one flight by either of these types to cater for this peak, without passenger spill occurring due to excessive load factor. This may be the airline's only option if there are slot and air-traffic restrictions preventing more frequencies.

Lower traffic volumes will allow single frequencies with the 767-300. Taking the 767-300's two-class configuration at 269 seats, a 70% load-factor constraint would mean it could cater for a peak demand of up to about 188 passengers.

The largest narrowbodies in most airlines are the 185-seat A321 and 201-seat 757-200. These could cater for demand of up to 130-140 passengers at a 70% load factor. The 767-300/-400 and A330-200 could therefore cater for a demand peak with a single frequency from 130-140 passengers up to about 210.

The 767-400 and 767-300 have a high level of commonality. This would therefore allow the 767-300 to cope with routes with smaller peaks of 140-186 passengers, and the -400 with higher peak demands of 187-210 passengers. The commonality between the two means that an operator would have the costs of only one aircraft type in respect of spare parts and pilot training. There is also the 767-200, which is operated by a few carriers on short-haul networks in North America. This could provide capacity between the 757-200 and 767-300. The recently introduced 757-300 could also fill this role.

The A330-200 lacks any parts, engine or pilot commonality with the A300-600 and A310. Using either the A300-600 or A310 to cater for smaller demand peaks on some routes would involve using two aircraft types, which would raise overhead-related costs for this option compared to a 767-300/-400 solution.

Another option for an A330-200 operator wishing to maximise commonality would be to use an Airbus with which aircraft it has higher commonality, such as the A321. Its capacity of 185 means the A330-200 would have to cater for passenger demands between 130 and 210 during the peak, the same as the 767-300/-400 option. Airlines are therefore likely to use just the A330-200, rather than the A310 or A300-600 in addition to cater for demand higher than the A321's capacity.

The A330-200 has higher trip costs than the 767-300. The lack of a smaller Airbus widebody that has commonality with the A330-200 is its weakness compared to the 767-300/-400 option.

Because of this, an A330-200 operator will be forced to accept higher trip costs, and an equally lower gross profit, compared to the 767-300 over a passenger demand of 130-186 passengers. A 747-600 (which will incur trip costs similar to the A330-200) is required only when passenger demand has reached 187, which would result in an operator's costs, and therefore gross profit, being similar irrespective of aircraft selection. In this case then the gross profit generated by either type will be similar.

The trip costs for an A330-200 on a 600nm trip are $14,900. The 767-300

The A330-200 has won almost three times more orders than the 767-400. The A330-200 has also gained sales from eight major 767-300 operators. The A330-200's trip costs are higher than the 767-300's. If airlines choose to operate the A330-200 instead of a smaller type at the same levels of passenger demand as they would the 767-300, they will incur about $1.6 million more in fuel, maintenance, crew and finance costs compared to a 767-300. The A330-200 can offset this with its higher belly freight capacity.

and -400 have trip costs of $14,200 and $15,000.

This includes fuel at 80 cents per gallon, maintenance, flight crew and flight attendants, landing and navigation charges, catering at $8 per passenger, and lease costs based on a 20% purchase discount and a lease rate factor of 0.9% per month. This is based on cost levels similar to those of North American and European airlines.

Multiple frequencies

Introducing single frequencies with larger aircraft for these routes at peak times adds another aircraft type to the A320 or 737/757 family fleets operated by the carriers during the less busy periods. Another aircraft type adds overheads related to pilot training, spare parts, engine inventory and maintenance.

The alternative to single frequencies is multiple frequencies with narrowbody types, if frequencies are not constrained by airport slots. This would minimise the number of aircraft types, and so reduce related overheads. It would, however, incur the higher trip costs of multiple narrowbody flights.

The alternative to the A330-200, which caters for peaks of 130-210 passengers, would be single A318 and A321 flights, which would combine to provide 204 seats when a 70% load factor constraint is imposed. Another alternative would be three A318 flights.

One A321 and one A318 flight would incur trip costs of $17,300, $2,400 more than a single A330-200 operation. Three A318 flights would cost $6,700 more than operating the A330-200. This higher cost of multiple frequencies would only be worth incurring if the peak occurred over an extended period, and the lack of frequency threatened the loss of traffic and dilution of premium passenger revenue.

In the case of a 767-300 catering for 140-186 passengers, the alternative would be for a single 737-600 and -800 frequency. Two 737 flights would cost $16,300 - $2,200 more than a single 767-300 sector. For 187-210 passengers, the alternative to a single 767-400 operation would be one 737-600 and one 737-900 flight. This would mean a higher charge for the two 737 flights totalling $2,000.

The A330-200 and 767-300/-400 clearly offer economies of scale when airlines are forced to operate larger types.

The $500 trip cost difference between the 767-300 and A330-200 is too small for the lack of a common type smaller than the A330-200 to give the Airbus option a disadvantage in gross profit-generating capacity when operating short-haul routes of less than 1,000nm during peak periods.

One overriding factor influencing aircraft selection will be the operator's existing narrowbody fleet and the savings from commonality that these aircraft will have with either the 767 or A330.

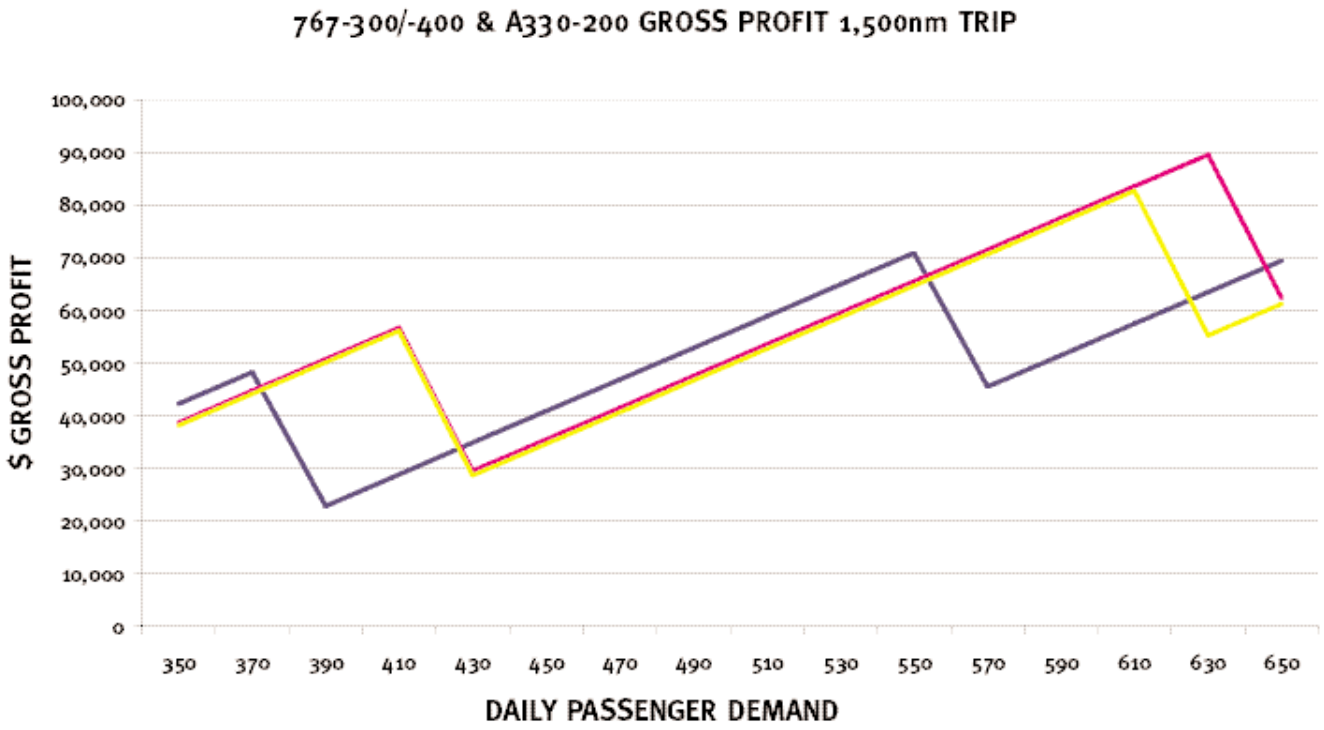
Another major influence will be that airlines already operating the 767-300 are likely to select the 767-400, especially if they still require the 767-300's capacity. Airlines will also consider overall capacity requirements. If the 767-300/-400 or A330/340 are also needed for medium- and long-haul routes, the economics and capacity requirements of this network will take priority. An airline may select the A330-200 even if it is a 737/757 customer. SAS is one example.

Regional routes-high density

Examples of high-density routes using widebody twins at two to four daily frequencies are sectors from London, Paris and Frankfurt to Cyprus, Turkey, Greece, the Middle East and Africa. Others are US trunk and trans-continental routes, and routes between the US and South America.

In this case the A330-200 or the 767-300/-400 will be selected depending on traffic growth, and when the 757, A310 and 767-200 have been outgrown. Although the A300-600 could be used to cater for lower traffic volumes, airlines are likely to order the A330-200 in isolation because of the lack of commonality between the two Airbus types. The A300-600 also lacks the range performance to be flexible in these markets.

Assuming a 70% load-factor constraint and seat capacities similar to US two-class configuration, a 767-300 operating at two daily frequencies can cater for demand of up to about 370 passengers *(see chart, page 23)*. After this level its frequency would have to be increased to three, so a 767-400 would cater for demand of 370-430 passengers at two frequencies *(see chart, page 23)*. The A330-200 would cater for demand with two frequencies up to 425 passengers, and so would compete at the same frequency with the 767-300 up to 370 passengers, and then with the 767-400 up to about 430 passengers. Here the A330-200's higher trip costs would give it a disadvantage against the 767-300, since both would generate the same revenue. Based on a European/North American cost base *(see assumptions box, page 23)*, the A330-200's trip costs on a 1,500nm sector are, however, only $2,100 higher than the 767-300's. Therefore, at the same level of passenger demand, revenue and twice-daily flight frequency, the



A330-200 will have a gross profit disadvantage of $4,200 against the 767-300 *(see chart, this page)*. This is equal to an advantage of $1.7 million per aircraft per year for the 767-300 over the A330-200 at a utilisation of 770 FCs per year *(see assumptions box, this page)*.

The A330-200 may be able to overcome this disadvantage from its higher belly-freight capacity and revenue-earning power over the 767-300. This could therefore allow the A330-200 to make up for its gross profit shortfall. With a 70% load factor, the difference in additional structural payloads available for freight is 8,000lbs. This difference will be reduced once some of the belly space for passenger baggage and freight packing density is accounted for. The A330-200 may still have a trip cost and so gross profit disadvantage. If the A330-200 operator is able to fill 4,000lbs at a rate of 50 cents per lb it will have overcome part of the gross profit shortfall.

The 767-400's and A330-200's trip costs are virtually identical for a 1,500nm sector trip, and so would generate similar gross profits *(see chart, this page)*.

While the A330-200 lacks a smaller sister variant to better match the 767-300's trip costs, the A330-200 does have commonality with the larger A330-300.

The A330-300 has a standard US two-class configuration of 335 seats. The two models have the same pilot type rating, engines and components. More importantly, the A330-200/-300 have an identical flightdeck and cross-crew qualification (CCQ) with the four long-range A340 variants. This reduces transition training between the A330 and A340 to just 1-3 days, thereby allowing economical mixed-fleet flying with the two. Airlines that need a type larger than the A330-200 for these high-volume routes can introduce the A330-300 or an A340 model and maintain a high level of commonality.

In contrast, the next largest Boeing aircraft to the 767-400 is the 375-seat (US two-class) 777-200. This has no commonality with the 767, and so the 777 introduces a new type for airlines that require larger capacity. While the A330-200 may be at a disadvantage to the 767-300 at lower passenger volumes, the 767-400 and 777-200 will be at a disadvantage to the A330-200/-300 at higher levels of demand.

The transition training between the 767-400 and 777 is 11-15 days, which still makes mixed-fleet flying economical. A 767-400/777-200 combination, however, uses two aircraft types compared to one for the A330-200/-300. The situation becomes equal again when an A330 operator requires long-range performance, and introduces the A340 as a second type. The A340 has several commonality benefits with the A330.

OPERATING COST ASSUMPTIONS FOR 767-300/-400: 1,500NM REGIONAL ROUTE

Seats: 767-300: 269; 767-400: 304; A330-200: 293.
Annual utilisation: 2,850 block hours/770 flight cycles
Fuel price: 80 cents per US Gallon
Maintenance costs: 767-300/-400 : $1,175 per BH; A330-200: $1,235 per BH
Crew salaries: 767-300: Captain & First officer: $160,000; 767-400/A330-200: Captain & First officer: $164,000. Crew cost escalated by 25% for all employment-related costs.
Catering: $17 per seat average.
Finance: Aircraft acquired at 20% of list price, financed at 0.9% monthly lease-rate factor.

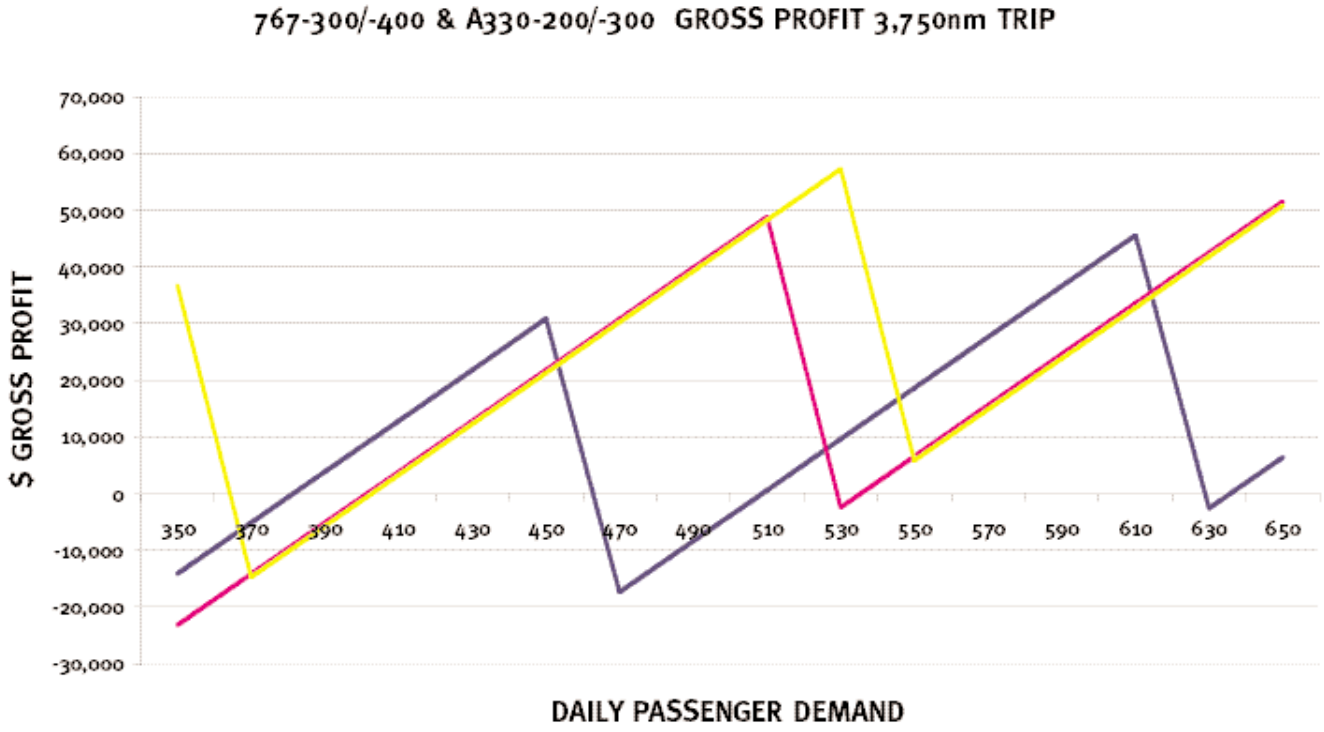
Long-haul operations

The A330-200 and 767-300/-400 are used in medium- and long-range operations by airlines from all regions of the world. The majority of these operations are routes in the 3,000-5,000nm range, and a 3,750nm sector is representative of an airline mission length.

First, the 767-300/-400 and A330-200 should be examined in isolation before the effects of commonality with younger or larger counterparts, and the influence they have on selection, are considered.

Given typical North American and European airline cost bases, the 767-300 has a trip cost of $57,200 for fuel, maintenance, flight-crew, landing and navigation charges, and catering and aircraft lease costs *(see assumptions box, page 24)*. The 767-400's and A330-200's trip costs are both about $60,300, with only a $200 difference between them.

The A330-200 has the same problem with the 767-300/-400 as on shorter mission lengths: the absence of an A330



OPERATING COST ASSUMPTIONS FOR 767-300/-400: 3,750NM ROUTE

Seats: 767-300: 218; 767-400: 245; A330-200: 253.
Annual utilisation: 4,200 block hours/510 flight cycles
Fuel price: 80 cents per US Gallon
Maintenance costs: 767-300/-400 : $975 per BH; A330-200: $1,025 per BH
Crew salaries: 767-300: Captain & First officer: $160,000; 767-400/A330-200: Captain & First officer: $164,000. Crew cost escalated by 50% for all employment related costs.
Catering: $26 per seat average.
Finance: Aircraft acquired at 20% of list price, financed at 0.9% monthly lease rate factor.

variant smaller than the -200 with lower trip costs similar to the 767-300's. While the trip cost difference between the 767-300 and A330-200 is in the order of a few hundred dollars on shorter routes, it is more than $3,000 on this long-haul mission. This will be equal to the gross profit difference between the two for the same level of passenger demand. This will be magnified for multiple frequencies, representing a large loss for an A330-200 operator. That is, a typical route frequency of three daily flights will generate about $9,600 higher gross profit with the 767-300 than it will with the A330-200 *(see chart, this page)*. At an annual utilisation of 510 FCs, this cost and gross profit difference will be equal to about $1.6 million per aircraft annually in the 767-300's favour. This shortfall could possibly be made up by the A330-200's higher additional belly-freight capacity.

At a route length of 3,750nm and passenger load factor of 70%, the A330-200 has an additional belly-freight capacity of just 6,500lbs more than the 767-300. This will only aid the A330-200 in making up its shortfall if there is sufficient demand to fill the additional belly freight. This will not incur extra pure revenue, however, since the freight will incur substantial ground-handling charges.

The relative difference in trip costs between the 767-300 and A330-200 is the same or similar in all other global markets for identical route lengths. This similarity is explained by the fact that fuel, maintenance and finance charges account for a high proportion of aircraft operating costs. The 767-400 and A330-200 will also be close in all markets.

The problem is that the 767-300 has already cornered the mid-size, long-haul market. This should favour the 767-400 over the A330-200, because of the overheads incurred when adding a new type to the fleet. Large numbers of 767-300s are operated by US majors, and only one, Delta, has ordered the 767-400. Only US Airways has ordered an aircraft of the 767-400's or A330-200's size.

The A330-200 has won orders for 134 aircraft from 26 customers. This is 86 more aircraft than the 767-400. Eight A330-200 customers are previous 767-300 operators, including EVA Air, Qantas, Air France, Asiana and Gulf Air.

Many A330-200 customers also operate the A320 family or A340, and so manufacturer commonality and the various benefits accrued will be in overriding contrast to the lack of an A330 variant smaller than the -200.

Summary

Given the A330-200's success over the 767-400, it is perhaps surprising that the smaller A330-500 has not been launched. The cost and gross profit difference between the A330-200 and 767-300 indicates that airlines could benefit from the proposed A330-500 model

Despite the 767-300's success, the A330-200 is outselling the 767-400 in both total orders and number of customers. The A330-200 has also been successful in taking orders from eight 767-300 customers, some which have also ordered the 777.

There are several explanations for a possible lack of interest from airlines in the A330-500. Traffic growth will diminish the need for this aircraft, and the A330-200 will be large enough to suit most airlines. Also, a shortened A330 will be heavy relative to its seat capacity and this will diminish some of the advantages of shrinking the A330-200. In addition, the A330-200's higher belly-freight capacity, if used, can make up much of the difference of passenger gross profit it has with the 767-300. Some passenger airlines have become more organised in marketing belly-freight capacity, and the yields and revenues will make additions to passenger gross profits. AC