The A330-200F offers similar payload and capacity to the DC-10-30CF, and other freighters. While the A330-200F has the benefit of long range capability, the large number of DC-10-30s and low values of other aircraft provide a challenge the A330-200F will find hard to meet.

Can the A330-200F meet the challenge of converted aircraft?

Airbus is offering the A330-200F as another aircraft in the 50-70 ton category. The aircraft also has a main and lower deck containerised volume totalling 15,300 cubic feet *(see table, this page)* and structural payload of 138,000lbs and 61 tons. This means its closest competitors, in terms of structural payload and containerised volume, are the DC-10-30CF and 767-300F *(see table, this page)*. The two next closest competitors are the MD-11F and A300-600RF.

The A330-200F is only available as a new aircraft, while its competitors are now available as converted models, giving it finance charges up to three and a half times higher than alternatives of a similar size. The A330-200F has the advantage of lower cash operating cost elements of fuel, maintenance and flight crew in some cases compared to its four closest rivals. It also has good long-range performance, and it is able to carry a full payload up to 4,250nm. This is 750nm further than the DC-10-30CF and 1,000nm more than the 767-300F can carry their maximum payloads *(see table, this page)*. This raises the issue of whether one of these converted aircraft can outperform the A330-200F on the basis of gross profit generated.

The DC-10-30CF is particularly interesting, since there are large numbers of passenger aircraft available. This makes the total build cost of the DC-10-30CF low; in the region of about $20 million for a passenger aircraft acquired for high rate of $5 million. Lease rates of DC-10-30CFs were in the region of $250,000 per month prior to 11th September 2001. Aerospace Finance International is reported to have recently bought five ex-Iberia DC-10-30s for a total of $5 million, which will allow a low build cost and lease rates if they are converted to freighters.

This compares to a list price in the region of $120 million for the A330-200F. Current financing terms and price discounts mean that lease rates will be in the region of $800,000 per month.

Gemini Air Cargo, which already operates a fleet of DC-10-30CFs and MD-11Fs, has been examining the A330-200F. "We were pushing Airbus for an aircraft with a 65 ton capacity, since this makes a difference compared to the current aircraft with a 61 ton capacity," says Bill Stockbridge, chief executive officer at Gemini Air Cargo.

Depending on mission length, the DC-10-30CF, or 767-300F, is capable of performing most missions with the same payload capability as the A330-200F.

Aircraft options

Selection between these five aircraft types will first depend on the type of freight they are to carry, plus the container types being used. Small packages having a typical packing density of 6.5lbs per cubic foot, while general freight is slightly higher.

The payload specifications and volumetric payloads of the A330-200F, MD-11F, DC-10-30CF, A300-600RF and 767-300F are shown *(see table, this page)*.

This shows that the structural payloads of the five aircraft vary from the A330-200F's by 29,000lbs (A300-600RF) and 52,000lbs (MD-11F). Although the MD-11F has a much higher payload than the A330-200F (meaning the two would not normally be regarded as direct competitors) the reduction in payload at sectors longer than 4,000nm means the DC-10-30CF has a lower payload than the A330-200F. The MD-11 would thus be the closest alternative to the A330-

PAYLOAD SPECIFICATIONS OF A330-200F, MD-11F, DC-10-30CF, A300-600RF & 767-300F

Aircraft	A330-200F	MD-11F	DC-10-30CF	A300-600RF	767-300F
MTOW (lbs)	513,000	625,500	572,000	375,900	412,000
Structural payload (lbs)	138,000	190,100	147,000	109,740	121,000
Containerised volume (cu ft)	15,300	20,116	17,458	13,712	15,696
Packing density (lbs/cubic foot)	6.5	6.5	6.5	6.5	6.5
Volumetric payload	99,450	130,754	113,477	89,128	102,024
Range with maximum payload (nm)	4,250	3,800	3,500	2,600	3,250

PAYLOAD SPECIFICATIONS OF A330-200F, MD-11F, DC-10-30CF, A300-600RF & 767-300F

Aircraft	A330-200F	MD-11F	DC-10-30CF	A300-600RF	767-300F
Structural payload (lbs)	138,000	190,100	147,000	109,740	121,000
Containerised volume (cu ft)	15,300	20,116	17,458	13,712	15,696
Volumetric payload	99,450	130,754	113,477	89,128	102,024
Available payload at route length (lbs)					
3,000nm	99,000	130,000	113,000	89,000	102,000
4,000nm	99,000	130,000	113,000	70,000	102,000
5,000nm	99,000	130,000	113,000	0	84,000

200F if high payload capacity were required.

Once a packing density of 6.5lbs per cubic foot is taken into account, the payloads of the five aircraft are closer in range *(see table, this page)*, highlighting why the aircraft should be considered together.

Since the A330-200F has a long-range capability, the gross profit performance of the aircraft should be analysed on long range missions. This will also result in high aircraft utilisations in comparison with most freight operations, which will have an impact on financing costs. Despite its high list price and consequent lease rates, the A330-200F will benefit from high utilisations, which in turn will affect its gross profit performance.

Route lengths & operation

The A330-200F's combination of high list price and long-range capability mean that it is best suited to trans-Atlantic missions, and operations between Europe and Asia, as well as North-South routes between Europe and Africa or the Middle East, or between North and Central/South America.

The majority of these routes will be missions of 3,000-5,000nm, so it is appropriate to analyse the aircraft on these sector lengths.

The gross profit performance of each aircraft should be analysed to illustrate the differences between aircraft types in terms of revenues less the costs of fuel, maintenance, flight crew, finance charges, airport user fees and navigation charges. The gross profit performance should also be examined over a range of freight traffic volumes, and for several route lengths. The available payload of the aircraft changes with route length, so the best performing aircraft can be analysed for different levels of operation.

While the A300-600RF and 767-300F have smaller capacities than the A330-200F, it is likely that the gross profit performance of the smaller aircraft will be better than the A330-200F at low freight volumes. Freight volumes vary for each route, and bi-directional differences can also be large. Gross profit analysis over a range of freight volumes and different sector lengths allows the performance of each aircraft type to be examined for conditions that more closely reflect a route network than a single mission.

The three route lengths used are 3,000nm, 4,000nm and 5,000nm, with freight volumes on each between 60,000lbs and 128,000lbs. These sectors reflect the most likely route lengths for which a freight operator would consider the A330-200F, and are therefore the sectors on which the four converted aircraft would have to compete against the A330-200F. Increasing route lengths will mean increasing aircraft utilisations. An average mission length of 3,000nm may generate annual utilisations of 430 flight cycles (FC) or about 3,000 flight hours (FH); a 4,000nm route length 540FC/3,500FH; and 5,000nm 650FC/4,000FH.

The different route lengths will also affect available payload for each aircraft. The range of each aircraft with maximum structural payload is shown *(see table, page 43)*. The range for available volumetric payloads for 3,000nm, 4,000nm and 5,000nm sector lengths with zero wind is also shown *(see table, this page)*.

The reduction in capacity for the DC-10-30CF, A300-600RF and 767-300F for 4,000nm and 5,000nm routes compared to 3,000nm sectors gives the A330-200F a revenue earning capacity advantage on longer routes. This is its key advantage over older converted types.

Revenue generated rises as freight volume increases, while trip cost for each type remains almost the same except for an increase in fuel burn. Airlines will have to use a load factor cut-off point at which an additional frequency will be added to cater for the higher traffic volume. Larger aircraft operating a single frequency will therefore have an advantage over smaller types which would have to operate dual frequencies.

Load factor cut-off points for passenger aircraft are lower than freight operations. High freight load factors are required to break even, since yields and revenues are low compared to trip costs. Freight carriers also have more flexibility in varying freight loads to defer shipment to a later flight in some cases, or send some shipments to other airlines in others. A load factor cut-off point of 90% has therefore been used in this analysis. This means that the A330-200F, for example, will carry up to 89,000lbs at a packing density of 6.5lbs per cubic foot before a second frequency is added. Revenue will therefore increase with freight volume up to 89,000lbs, while trip cost will remain almost the same, except for a small increase in fuel burn.

Aircraft with the highest rate of payload reduction with increasing range will suffer the largest fall in gross profit generating ability compared to the long-range A330-200F. This means the DC-10-30CF and A300-600RF will be at the biggest disadvantage to the A330-200F, especially on a route length of 5,000nm. Although the DC-10-30CF can carry a payload of 113,000lbs at 5,000nm, this is on the edge of its payload-range performance in still-air conditions. Normal headwinds will add about 500nm to a 5,000nm route on most occasions, reducing the DC-10-30CF's capacity to a maximum of 90,000lbs.

This means airlines will have to consider the MD-11 as the closest alternative to the A330-200F on a 5,000nm mission. The MD-11F is therefore analysed only on the 5,000nm mission, since the DC-10-30CF is an adequate alternative on 3,000nm and 4,000nm sectors.

The 767-300F's available payload of 102,000lbs at 4,000nm and 85,000lbs at 5,000nm is on the edge of its payload-range ability. Like the DC-10-30CF, the 767's payload could also be reduced by operating conditions. This also makes it a marginal competitor to the A330-200F on these two route lengths.

The A300-600RF's available payload of 70,000lbs on a 4,000nm sector is also

The large supply of DC-10-30s means total build costs for a freighter are down as low as $15 million. This puts the lease rate of new-build DC-10-30CF's down to about $175,000 per month, which a new A330-200F will find it hard to compete with.

on the edge of its ability. This will be reduced by a headwind, thereby diminishing its effectiveness as an alternative to the A330-200F to routes shorter than 3,000nm.

Gross profit analysis

The gross profit performance analyses were made on several assumptions. The payloads used are those available to each aircraft with zero wind conditions *(see table, page 44)*. "The DC-10-30 is not badly affected by operating conditions on our routes to Latin America," says Stockbridge. "We do multiple stops on routes from hot and high airports in Latin America, which shortens the route length and makes it possible for the aircraft to complete the trip. The DC-10-30 has no problems from Bogota, Medin and Sao Paolo."

The analysis also ignores possible payload restrictions due to high ambient temperatures and airport elevations. Thus the analyses gives the DC-10-30CF, A300-600RF and 767-300F higher payloads than may actually be available to them on the sector lengths analysed.

Fuel price used is 70 cents per US gallon.

The cost elements used for maintenance per block hour (BH), annual flight crew charges and monthly lease rates for each type are as follows:

- Maintenance costs
A330-200F: $1,300/BH
MD-11F: $1,480/BH
DC-10-30CF: $1,875/BH
A300-600RF: $1,235/BH
767-300F: $1,285/BH

- Annual flightcrew costs
A330-200F: $306,000
MD-11F: $344,000
DC-10-30CF: $431,000
A300-600RF: $275,000
767-300F: $275,000

- Monthly lease rate
A330-200F: $800,000
MD-11F: $550,000
DC-10-30CF: $250,000
A300-600RF: $325,000
767-300F: $325,000

The maintenance costs per BH take account of probable reserves for base checks and engine shop visits, as well as the costs of access to, and repair of, rotable components, and line maintenance. They do not, however, include provisioning for spare engines. This would give the DC-10-30CF a higher rise in maintenance costs than all other types, since it has three engines that have shorter on-wing times compared to other types.

The annual flightcrew costs take account of probable freight airline salary scales, number of flight crew members and the additional costs for training, allowances and subsistence.

The monthly lease rate of $800,000 for the A330-200F is based on the aircraft's list price of $120 million and probable discounts and monthly lease rate factor with current financing techniques.

The lease rates used for the four converted aircraft reflect market lease rates. These vary according to airline credit rating and aircraft availability.

The yields used are 60 cents per lb, 80 cents per lb and 90 cents per lb for the 3,000nm, 4,000nm and 5,000nm sectors. These are higher than most airlines are likely to experience. While the high yields are arbitary, they do illustrate the gross profit differences between the types for the same freight volume.

3,000nm & 3,000BH

The trip costs for this mission length vary from about $34,000 for the A300-600RF and 767-300F, to $45,000 for the DC-10-30CF and $56,000 for the A330.

This equates to a cost per lb of 34 cents for the 767-300F, 39 cents for the 767-300F, 40 cents for the DC-10-30CF and 57 cents for the A330-200F.

This compares to revenues of $36,000 for a 60,000lbs load, up to $61,000 for a 101,700lbs load, the maximum possible for the DC-10-30CF.

These trip costs and freight yields allow the DC-10-30CF, A300-600RF and 767-300F to generate a gross profit with high loads on a single frequency. The yield of 60 cents is artificially high, and the range of freight loads across which the three aircraft could generate a gross profit will be narrower for lower yields.

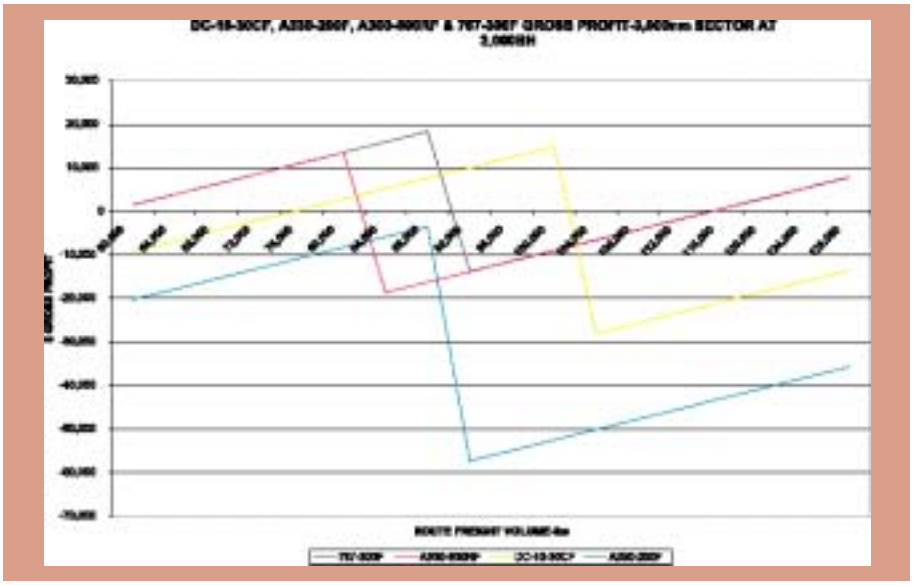
Even at this high yield, the A330-200F's costs are too high for a gross profit to be made. The 767-300F has the lowest cost per lb, and so the lowest load factor for the aircraft to break even. The 767-300F also has a similar capacity to the A330-200, and so the two have almost the same load factor breakpoint for adding an additional frequency.

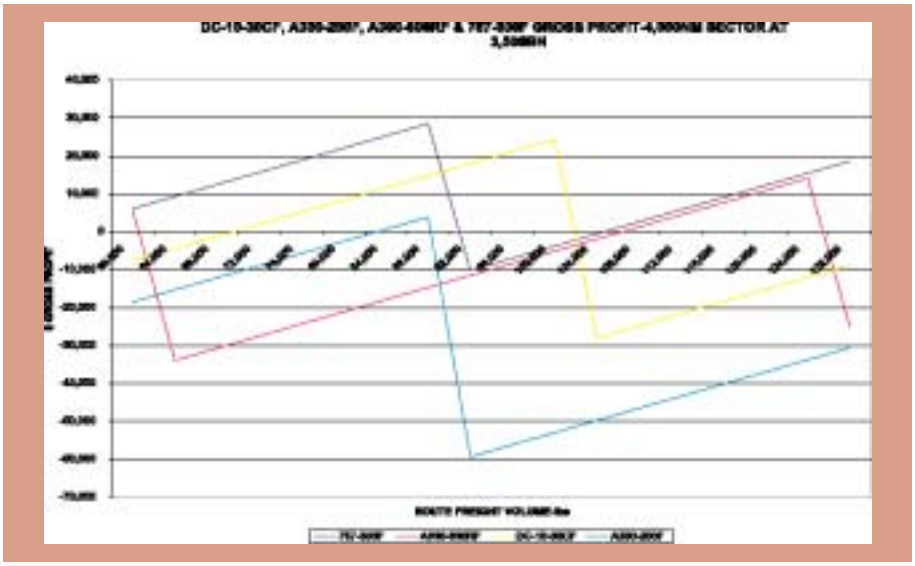
The 767-300F used in this example, however, is the highest gross weight variant of the type, and it will be several years before this becomes available at the lease rate used. Older and lower gross weight models will become available first, and so could provide the most economic alternative to the A330-200F for this route length. The A300-600RF's disadvantage is its lower payload capacity in comparison with trip costs similar to the 767-300F's.

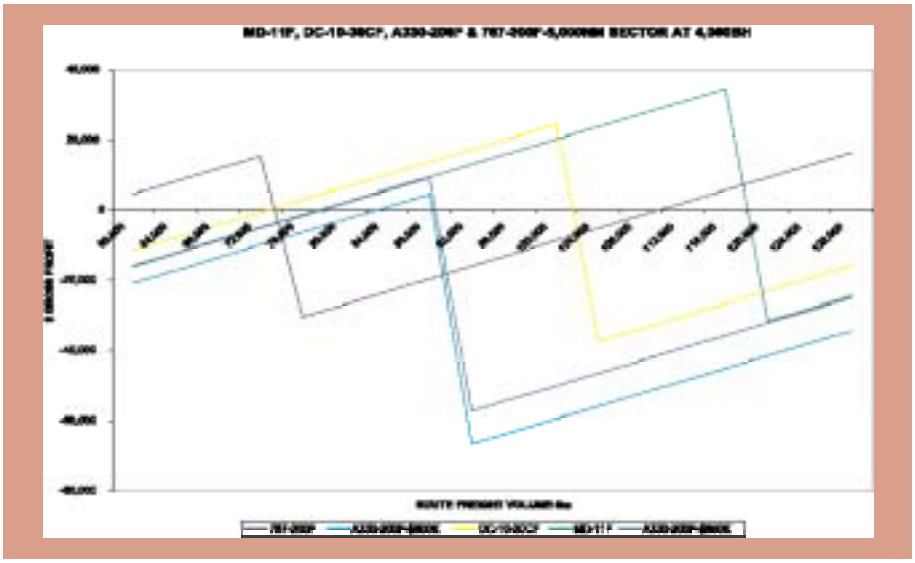
The DC-10-30CF is clearly the better selection for traffic volumes higher than about 89,000lbs and up to about 102,000lbs *(see first chart, page 48)*. The DC-10-30CF's main advantage is its low build cost and lease rates.

4,000nm & 3,500BH

The A300-600RF's limited payload on this route length clearly shows that it is a non-contestant, since it has to operate a second frequency for loads higher than 60,000lbs, while neither the 767-300F or A330-200F have to add a second until a traffic volume of 90,000lbs is reached. This is reflected in the A300-600RF's cost per lb of 48 cents, compared to the 767-300F's







cost of 41 cents. The DC-10-30CF has a cost per lb of 49 cents, but is able to break even at load factor low enough for it to make a gross profit.

The A330-200F has a cost per lb of 67 cents, meaning it can just make a gross profit with the highest load factor *(see second chart, this page)* with the artificially high yield of 80 cents per lb.

This suggests the 767-300F is the best aircraft for smaller traffic volumes, and the DC-10-30-CF for higher traffic levels for this sort of route length.

This advantage over the A330-200F may be exaggerated, since practical operating conditions on some routes means the 767-300F and DC-10-30CF will not be able to carry such high loads. This will reduce the load factor points at which they will have to add second frequencies. They will, nevertheless, still be able to generate a high gross profit in comparison to the A330-200F. Stockbridge, however, comments that the DC-10-30 is a good aircraft for this sort of missions. "The A330-200 requires ultra long-range missions and a higher payload for its economics to stack up. We are putting the aircraft on ice until the market improves or the prices on new aircraft reduce, but our requirement for a 65 ton payload is still critical. The DC-10-30CF is a good aircraft on our long routes, for example Miami-Buenos Aires which is 3,800nm."

5,000nm & 4,000BH

Despite a long route length and high aircraft utilisation, the A330-200F still has a high cost per lb compared to the alternative aircraft *(see third chart, this page)*.

The A330-200F has a unit cost of 75 cents per lb when it has a lease rate of $800,000. To illustrate the improvement in economics with a lower monthly lease rate, the aircraft has also been analysed with a monthly lease rate of $650,000 *(see third chart, this page)*. This reduces unit cost to 70 cents per lb. This allows the A330-200F to have a gross profit profile closer to the MD-11, but still prevents the A330-200F from having the same performance as the DC-10-30CF *(see third chart, this page)*.

Despite a reduced payload capacity on this long-distance mission length, the 767-300F is still able to generate a unit cost of 48 cents per lb. The DC-10-30CF has a unit cost of 58 cents per lb, while the MD-11 has a unit cost of 53 cents per lb. These aircraft all outperform the A330-200F. The best combination is provided by the 767-300F, DC-10-30CF MD-11F for low, medium and high freight volumes *(see third chart, this page)*.

Practical conditions which may limit the 767-300F's and DC-10-30CF's payloads simply mean that the range of payloads across which the MD-11F is the most economic option will be wider. Even if the DC-10-30CF's payload is restricted by practical operating conditions to 95,000lbs and load factor breakpoint consequently lowered to 86,000lbs, the DC-10-30CF will still have a better gross profit performance up to almost the same point at which the A330-200F has to add a second frequency. This is because the DC-10-30CF's revenue generating capacity will be unchanged up to a load of 86,000lbs. In all cases the DC-10-30CF will be better than shown where more recently acquired aircraft will have a lease rate lower than $250,000, as a result of lower aircraft values and downward pressure on lease rates.