

DC-8 and 707 operators have experienced a rise in operating costs. This comes during an A300B4 shortage and when values of other types are too high. Operators may be able to get manufacturers to acquire replacements for them, or they will have to wait until lease rates are low enough.

# DC-8 & 707 replacement candidates line up

**D**C-8 and 707 advocates have long delayed the issue of their replacement. The operation of these old fleets has recently become harder as maintenance costs climb. Other market factors have changed which have altered the position of the DC-8/707 and the airlines that operate them.

Airlines with DC-8s and 707s fall into three categories. The first is small package operators. These mainly have DC-8-70s, but also -60s and charge high yields for reliable scheduled service. They also have balance sheet power, credit ratings and capital to raise debt and acquire new aircraft. These airlines all operate in the US or west Europe. They include UPS, Emery, DHL and ABX.

The second group includes airlines that run scheduled operations, but are not high yield. They are financially weaker, and therefore low capital cost

aircraft are essential. This group includes carriers like TMA, BAX Global and Kitty Hawk.

The third group includes small airlines operating ad-hoc charters from the US into Latin America, or Europe into Africa and the Middle East. Their operations generate low utilisations and yields. Some of these airlines do not have the financial ability to acquire even DC-8 and 707 replacements, since they may lack the credit rating required by lessors of replacement candidates. Acquisition of new aircraft may depend entirely on buying old aircraft at rock-bottom prices, such as 707s or DC-8-50s at \$1-2 million each. This has to be taken into consideration against current and pending noise regulations. The prevention of further Stage 3 hushkitting and registration of Stage 2 or hushkitted aircraft operating in EU airspace and forthcoming Stage 4 rules, will put

increasing pressure on this last category of operators. Their best chances are to acquire Stage 3 hushkitted DC-8-60s/-70s if a glut of them materialised following *en-masse* retirement by the major freight carriers.

## Operations and fleets

DC-8 operations can be divided into three categories. The first is US domestic small package operations. This is concentrated by a small number of specialist airlines, which use the DC-8-60 and -70 series.

These usually fly one return flight a day via a hub, only five or six days a week. The DC-8s are given the longer sectors, while the 727s the shorter ones. Utilisations are in the region of 500 flight cycles (FC) a year. DC-8s might fly an average stage length of 1,500nm, and so generate about 1,800 flight hours (FH) per year.

Although carriers like UPS reserved their DC-8-70s for international operations, they have recently downgraded them to US domestic services. This puts less stress on the aircraft, because of lower utilisations. UPS has, in the meantime, deployed new types on its trans-Atlantic services.

The second type of operation is trans-Atlantic small package carriage, flown by major carriers like UPS and DHL. This is still, to an extent, operated by DC-8-70s, but the role is now slowly being taken over by the A300B4, A300-600, A310 and 767. Although some of these aircraft do not have the capability to carry a full payload across the Atlantic, many are

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*The DC-8 operates in a variety of roles. Each of these has its own operating conditions and level of aircraft utilisation. This affects the level of unit costs achieved and so the economic performance that replacement aircraft must deliver.*



## DC-8, 707 &amp; REPLACEMENT CANDIDATE PAYLOADS AND LEASE RATES

Aircraft type	DC-8-73	DC-8-63	DC-8-55	707-320C	757-200SF
Available container volume cu ft	8,244	8,244	5,954	5,954	6,600
Volumetric payload @ 7lbs/cu ft	57,708	57,708	41,678	41,679	46,200
Lease rate \$/month	220,000	90,000	70,000	90,000	175,000
Aircraft type	767-300PF	767-200SF	A300-600	A300B4	A310-300
Available container volume cu ft	15,696	10,708	13,712	10,044	11,920
Volumetric payload @ 7lbs/cu ft	105,310	74,956	93,350	83,440	70,308
Lease rate \$/month	700,000	250,000	250,000	200,000	250,000

prepared to make technical stops, or fly with a restricted payload.

The widebodies also offer larger volumetric payloads, which will be required to absorb growth.

The third type of operation that DC-8s and 707s are used for is medium-haul routes from the US to Latin America, and Europe to Africa and the Middle East. These are served with the DC-8-50, -60 and 707.

These routes have varying stage lengths in the 1,500-3,500nm range. Most of these are within the 707's and DC-8's full payload capability, but some airfields pose serious problems for the aircraft because of their high elevation. This can mean payload restrictions, although freight operators always have the option of en-route stops.

These markets are reducing because of consolidation in the freight sector. UPS, for example, bought Challenge Air Cargo and now operates scheduled services to hot and high Latin American cities with the 757-200. This type of service then makes it hard for the ad-hoc charter airlines to compete, since services have become more dependable and payload restrictions less likely.

There are just over 100 DC-8-70s in operation, and these are used by BAX Global, DHL, Emery, Tampa Colombia and UPS. The latter has half the fleet.

There are another 94 DC-8-50s and -60s in operation. The majority are used by ABX, Air Transport International, Arrow Air, BAX Global, Emery, Fine Air, Kitty Hawk and MK Cargo. There are

also fleets of one to three aircraft operated by a few African and Latin-American carriers.

The make-up of the 707 fleet is similar to these small DC-8 fleets. Only about 50 aircraft now operate with airlines.

## Replacement

The main drivers forcing replacement are related to noise and maintenance costs. Noise regulations in Europe mean DC-8 and 707 fleets can no longer be increased. This means different types will have to be introduced into fleets that need to grow. Operators which have not already Stage 3 modified their DC-8s and 707s have until 2002 to do so.

Rising maintenance costs are, however, the biggest driver making the DC-8s less tenable. The problems are related to escalating manhours (MH) used in heavy checks and the shortage of parts. The reduction in DC-8 and 707 fleets meant many aircraft were cannibalised, leading to a high supply of components. Because parts are now becoming harder to acquire, market rates are reported to have doubled in the past five years. Airlines also used to rely on being able to repair rather than overhaul parts. Again, these units are running low and more overhauls are having to be performed, raising costs. Airlines have also avoided having their own rotatable inventories and repairing them, and instead have relied on a cheap supply in the aftermarket. Overall, these developments have led to a doubling of

rotatable repair costs and market values.

Aircraft reliability has also become poor, which affects service reliability and aircraft utilisation. This will lead to the replacement of DC-8-50s and -60s from major operators, and change of operation for DC-8-70s to shorter routes and lower utilisations.

That factor could release a large number of hushkitted DC-8s onto the market, which will satisfy the replacement requirements for some of the financially weakest operators, while also releasing inventories of parts.

The major operators, however, are more likely to require higher payloads, better operational performance and superior reliability. They will now be considering the economics of the smaller widebody types.

The first of these is the A300B4, although none of the original batch converted are available. More will have to be converted, but of the remaining fleet there are probably only 20-25 suitable candidate aircraft. Few of these have become available for conversion. The A300B4 has been available at a market lease rate of \$200,000-250,000 per month, although the lower rate makes it competitive against its younger competitors.

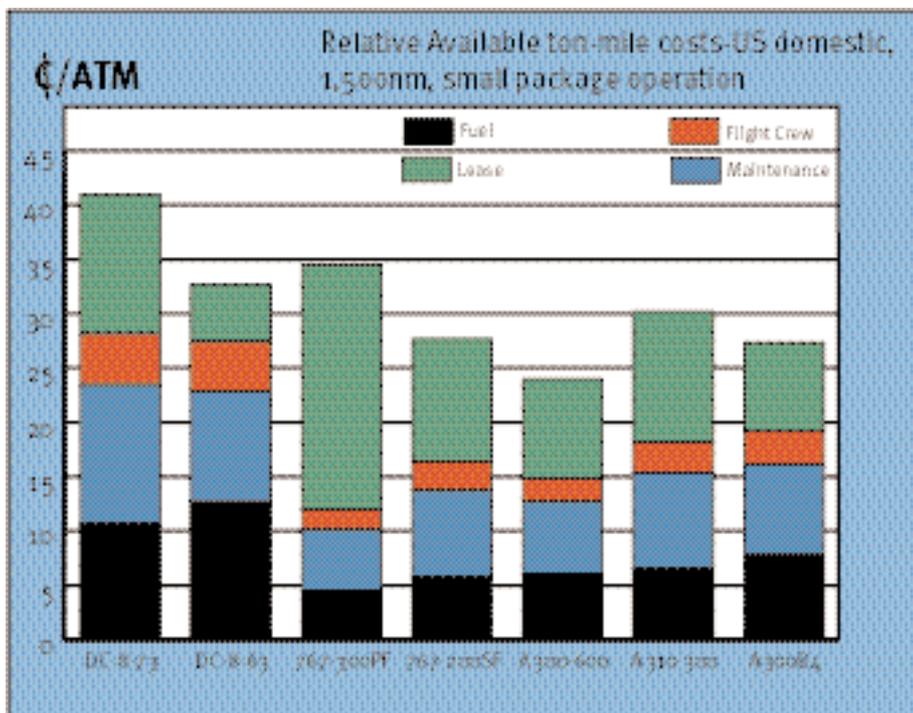
"C-S Aviation is looking to buy more aircraft," says Andy Toutt, director of programmes and acquisitions at C-S Aviation. "The problem is there are few good aircraft to buy. Regulations now mean component and maintenance documentation has to go back to birth in some cases, and records on many aircraft are missing. Bargaining prices have to be discounted heavily, down to the region of \$2.5 million. This will be for an aircraft that requires two engine overhauls, landing gear exchange and parts replacement and APU shop visit. This takes purchase price and maintenance costs to the region of \$7 million".

Total build cost for an A300B4 freighter is in the region of \$12-15 million, which will allow for a lease rate of \$200,000-250,000. The problem is that only another 5-10 aircraft may get converted.

Attention is now focussing on the A300-600, A310-300, 767-200 and 757-200.

The first A310-300s have been converted. Market values of passenger aircraft are about \$18-22 million, which, with bridging maintenance, conversion and other work, brings build costs to about \$27-31 million. Lease rate factors of 1.25-1.5% per month mean lease rates for the A310-300 will still be too high at \$380,000-400,000.

The A310-300's lease rates need to drop to the \$225,000-250,000 level for it to be competitive. This, in turn, means market values will have to drop to about



\$15 million for build cost to be near the maximum of \$25 million needed for lease rates to be acceptable.

From a lessor's and freight airline's point of view, the A310-300 is in a favourable position, since there are several fleets that will start to come off-lease or be sold by first-tier airlines in the next few years. This will increase the supply of aircraft and values will fall.

The A300-600 is in a different situation. There are fewer signs that aircraft will start to become available soon. American, for instance, has recently completed a long-term refinancing of its fleet. Lufthansa likes the A300-600 and has added to its fleet with two used aircraft. Korean Air, however, has concluded sale and leasebacks for two years, after which the aircraft could then become available. Emirates is also retiring its aircraft.

The A300-600 provides a lot of capacity and capability for an aircraft of its market value. The secondary market could be strong, since the A300-600 could make a good charter aircraft.

It is more likely that the A300-600 will not be on the market in numbers large enough to bring down values to an acceptable level for about five years.

Current market values are \$25-30 million and so total build costs for a freighter will be in the region of \$35-40 million. Like the A310-300, this is too high with a lease rate factor of 1.25-1.5% to provide the necessary lease rate of \$225,000-250,000 per month to make the aircraft economically viable. A300-600 market values will have to fall to \$15-18 million. This is unlikely for probably another five years.

It is more likely that a major operator with its own financing resources will

acquire a large fleet of A300-600s on its own and convert them to freighter. Another option is assistance from a manufacturer, in the form of a fleet exchange programme. Either of these would start the A300-600 conversion programme, but there will still need to be a large supply of used aircraft on the market for a conversion project to be viable for lessors.

Boeing has recently announced the development of the 767-200 freighter conversion programme with Aeronavali. Work is being concentrated on launching the first conversions with lower gross weight, 1982-84 build aircraft. These would be aircraft with maximum take-off weights (MTOWs) up to 352,200lbs. Boeing hopes to convert higher gross weight -200 and -200ER models at a later date; probably when they come due for retirement and their values have fallen enough.

Like the A300-600 and A310-300, maintenance and conversion costs for 767-200s that have been well-maintained by first-tier airlines will be in the region of \$9-10 million. Lease rates will need to be similar to those of the A310 at \$225,000-250,000. Manufacturer-assisted financing could provide a lease rate factor of about 1%, and so total build cost would be in the region of \$25 million. Market values would then have to fall to \$15 million.

Boeing expects 15-20 year old aircraft to get retired first. The earliest models were delivered to United, American and Delta. "We have been looking at availability, and admit this is a big concern," says Mike Stewart, vice president of passenger to freighter conversions at Boeing Airplane Services. "The 767-200 is a good aircraft for

passenger airlines, which is making it difficult to find good candidates. We see that values will have to come down to a distress value of \$12-15 million, from the current \$20 million".

The first 757-200s have recently begun conversion to freighter. The aircraft offers a similar payload to the DC-8-55 and 707. For the 757 to be economic against the DC-8-70 and widebodies, lease rates will need to be in the region of \$175,000. Bridging maintenance and conversion for well-maintained aircraft will be \$7-9 million. Values will then have to come down to \$9-10 million for build costs to be low enough to generate an acceptable lease rate.

For every aircraft type, current market values are still too high for their lease rates as freighters to be low enough.

The DC-8-55 and 707 have volumetric payloads of 41,678lbs with freight packed at 7lbs per cubic foot (see table, page 44). The DC-8-63/-73 have a payload of 57,708lbs at the same density.

The 757-200SF has a similar payload to the DC-8-55 and 707-320C, and so can act as a direct replacement.

The widebodies have payloads of 70,000-105,000lbs (see table, page 44).

DC-8 and 707 operators face a dilemma. Their current fleets are becoming more expensive to maintain, while there are no more A300B4s available to lease. The number may increase again if more get bought by the lessors, but this will only be for about 10-20 aircraft over an extended period. It will be another two or three years until sufficient numbers of 757s and other small widebodies become available.

## Replacement economics

Replacement economics should be considered in three scenarios. These are: US domestic small package operations, long-haul small package operations, and medium-range ad-hoc charters. These should analyse fuel, maintenance, flight crew and depreciation or finance charges.

US domestic operations would typically fly average stage lengths of 1,500nm and 520FC and 1,820FH per year. The aircraft types now being used are mainly the DC-8-63 and -73. These would be considered against all candidate widebodies.

The long-haul operation would fly sectors averaging 4,000nm. This would generate utilisations of about 450FC and 4,300FH per year. This stage length would present a problem to airlines, since many of the widebodies that airlines would have to consider are not capable of carrying a full volumetric payload this distance. If airlines had large enough payloads to fill the aircraft a technical stop would probably be required about halfway. A 2,000nm sector would then

increase payload capacity, but might also have the effect of raising unit costs because of inefficiency of a shorter stage length and extra handling and landing charges. Flight crew utilisation would also be reduced. The larger payloads on the shorter 2,000nm sector could counter the increase in unit costs.

Ad-hoc charters operate on a variety of stage lengths, but these might average 2,500nm. In some cases payload restrictions would be imposed because of hot and high airfields. These are mainly operated by DC-8-55s, 707s and DC-8-63s. The 757-200SF, A300B4, A310-300 and 767-200SF would all eventually be considered for these routes.

Utilisations are low, with about only 430FC and 2,400FH a year being generated.

The lease rates used in these three scenarios are summarised (*see table, page 44*). These are not yet achievable for the 757-200SF and widebodies, but are the rates the industry regards necessary to make them competitive.

The US domestic operation shows how the DC-8-63 is a desirable aircraft for up to a 57,000lbs payload. Despite its popularity, the DC-8-73 is actually less competitive, with a unit cost of 41 cents per available ton-mile (ATM) (*see chart, page 46*). This is explained by its higher

market lease rate. That will not be the case for aircraft owned and fully depreciated. In this circumstance the DC-8s will have unit costs in the region of 28 cents per ATM. This is equal to trip costs of about \$11,000.

In many cases the replacement candidates will have to compete on this basis. Despite many of them having efficiencies of two-man flight crews, twin-engines and lower fuel burn, the low utilisation will pose a challenge. Lease rates will therefore have to be low.

The A310, A300 and 767 all have the advantage of similar or lower maintenance costs than the DC-8 variants. The widebodies also have lower fuel burns and smaller flight crew costs. This is in contrast to their higher payloads.

The A310-300, at a lease rate of \$250,000 per month, will have a unit cost of 30 cents (*see chart, page 46*) and trip cost in the region of \$14,500. This type provides a 12,000lbs higher payload than the DC-8-63/-73, and is perhaps the first type a DC-8 operator would consider.

The A300B4 would be most airlines' first choice, however, because it is available at a lower lease rate and has a larger payload while offering slightly lower unit costs than the A310. The

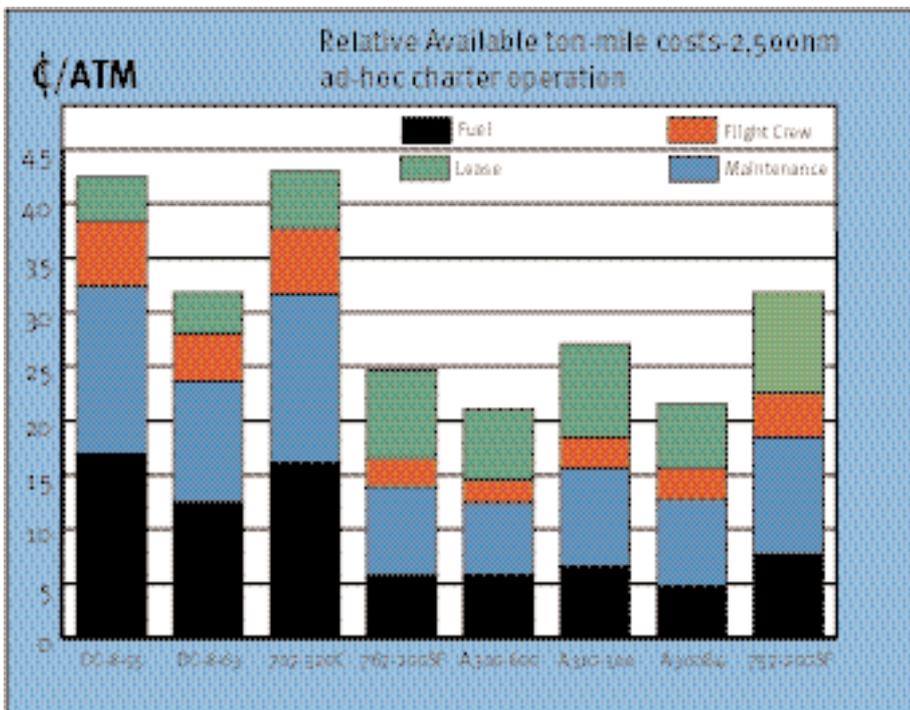
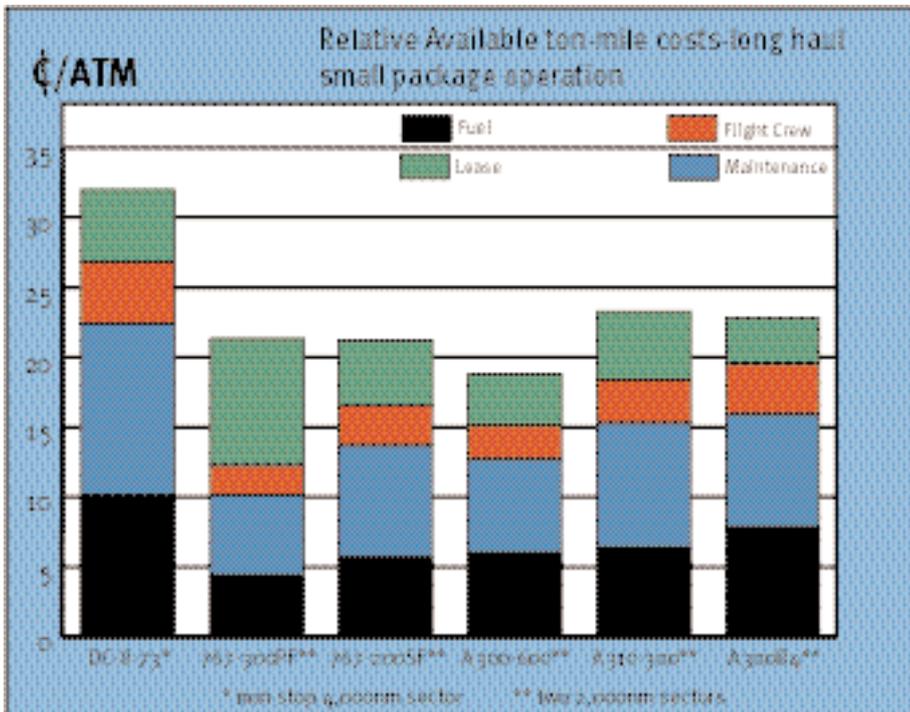
A300B4's trip costs are in the region of \$15,700. The A300B4, however, is in short supply. Although few of the 70 aircraft now leased have been taken up by DC-8 operators, several A300B4s have indirectly replaced the DC-8. ICC and Express.net both operate A300B4s on a wet-lease basis for Emery.

Because of a slightly higher payload than the A310-300, the 767-200SF can offer a unit cost of 28 cents per ATM, lower than the A310-300. The 767-200SF's trip costs are also a few hundred dollars less than the A310-300's.

The 767-200SF can be expected to have lower maintenance costs and has lower fuel burn. Both the 767-200 and A310-300 will still have to be available at the right lease rates for them to operate at this efficiency. This will not be for a few years. The lower gross weight 767-200s will therefore be good aircraft for US domestic operations from about 2002.

The 767 may have an advantage over the A310, since the 767 and 757 have a common pilot type rating. The 757 will be a replacement candidate for smaller DC-8 variants and 727s. The 757/767 combination will then present themselves as a 727/DC-8 replacement option.

If its payload is required, the A300-600 will provide some of the lowest unit costs possible, but not for



about another five years when values of passenger aircraft are low enough. At a lease rate of \$250,000, the A300-600 will also have slightly lower trip costs than the A300B4.

The factory-built 767-300PF is expensive. Its high payload dilutes the fuel, maintenance and crew costs. The high lease rate for a new aircraft makes it uncompetitive. Its unit cost of 35 cents per ATM does show, however, that if its capacity is required, a passenger-converted aircraft will be competitive. To offer the same unit costs as fully depreciated DC-8-60s/-70s, the 767-300PF's lease rate needs to fall by about a third to about \$420,000. Trip costs would still be around \$20,000, and could

only be justified if it transported almost twice the payload of those carried by DC-8s.

The long-haul scenario is one of replacing the DC-8-73. Because it has a high structural payload compared to its volume, the DC-8-73's volumetric payload would not be diminished on a 4,000nm sector.

A fully depreciated DC-8-73 can achieve unit costs of about 28 cents per ATM. All prospective widebody replacement candidates would suffer a payload restriction. The 767-200SF, A300-600, A310-300 and A300B4 would all be limited to 50,000-54,000lbs. Higher gross weight versions of the 767-200SF would be preferable for this

mission; which would have smaller or no payload limitations.

Despite this limitation, these widebodies would be able to deliver unit and trip costs of 28-30 cents and \$28,000-31,000, similar to the DC-8-73.

Operators are more likely to want to carry higher payloads, and so operate two 2,000nm sectors with a technical stop. Not including the additional handling and landing costs of a technical stop, the A300-600, A310 and 767-200SF are all capable of offering similar dollar trip costs for their two legs compared to the DC-8-73's non-stop 4,000nm mission. The higher payloads will then dilute the widebodies' unit ATM costs to 19-23 cents (see first chart, this page).

The economics of the 757 and widebodies at lease rates deemed competitive by the industry on ad-hoc, medium-range charters are good enough to compete against the DC-8-55, -63 and 707-320C. Even if the DC-8 and 707 were fully depreciated and had zero finance charges, they would still have higher unit ATM costs than younger aircraft (see second chart, this page). The major difference between the young and old aircraft in this scenario is the difference in fuel efficiencies, and fuel as a high percentage of total costs in this scenario. The younger aircraft are also able to dilute their costs with higher payloads, which will offset their higher trip costs.

The DC-8 and 707 also generally suffer a higher degree of payload restriction compared to the younger twin-engined widebodies when operating to hot and high airfields in Latin America (see *Freighters: how they stack up in hot and high operations, Aircraft Commerce, January/February 1999, page 42*). The DC-8 and 707 on these ad-hoc operations could therefore have higher unit costs than shown over a route network. Once younger aircraft become available at these required lease rates they will offer less risk than the DC-8 and 707.

Overall, it can be seen that the aircraft on offer can provide competitive economics when their lease rates as freighters and hence values as passenger aircraft have fallen sufficiently. It will be another five years before lessors can make an economic case of converting these aircraft. Before this occurs manufacturers may acquire used widebodies or 757s as part of a swap for new fleets and convert used aircraft for the freight carriers. This may be the only way the 767-200, 757, A300-600 and A310-300 can be offered to freight airlines at acceptable lease rates.

This leaves the smaller and financially weaker carriers, which will have to find ways to acquire components at economic levels. This will be until either the DC-8-73, 757-200SF or widebodies become available at lower lease rates. 