

The main widebody types that will retire in large numbers over the next five years include the 767-300ER, A330-200 & -300, the 777-200ER, and the 777-300ER. The options for each aircraft type are considered. Freighter conversion is often the preferred choice, often followed by part-out.

The available markets for used widebodies

The widebody market is not as liquid and as dynamic as the narrowbody market. Narrowbodies can be transferred relatively easily between operators, making them more tradeable assets, even at the end of their economic life. Transferring widebodies between operators is more expensive and time-consuming, due to the high cost of reconfiguration and customisation that major airlines incorporate in their flagship long-haul products. This limits the secondary market for widebodies, making them more risky investments. The available markets for used widebodies are examined here.

The main types under consideration are the last of the major 1980s widebodies: the 767-300ER and 747-400; the 777 family members; and the A330-200 and -300. Relatively few A300-600s, A310s and MD-11s are still in operation, making them almost negligible. The remaining A340-300 and -600 fleets are down to a minority of the original numbers built, and there are virtually no market opportunities for the last aircraft.

Market options

A mid-life aircraft is defined as having been operated for 12-18 years. The actual timing of this point in an aircraft's economic life depends on a number of reasons. First or second major airframe checks occur in this age range, while the original financing terms for these aircraft also terminate. This age bracket can also be close to the time that many life limited parts (LLPs) in the engines expire.

The expiry of the prime financing term is when lessors or financial institutions have to decide on the remarketing options for the aircraft.

The first option to be explored is the simplest: renegotiating a lease extension

for the aircraft with the existing operator. This may occur because deliveries of new generation aircraft are delayed, or the carrier has a higher than originally expected need for long-haul capacity.

If the aircraft is owned by the airline, the asset would be almost fully depreciated on the books by this age. The capital cost of ownership is a minor consideration, and keeping the aircraft is a viable option until the end of its useful economic life.

Some operators like Singapore Airlines (SIA), however, have strict policies of operating young fleets. The average age of the SIA fleet is just 6.5 years. Used aircraft available from this type of operator usually have a good maintenance status and are often transferred to another operator.

Most widebodies returned off-lease by their initial operators are not leased to a second passenger operator. For these aircraft, the main option is conversion to freighter if a passenger-to-freighter (P-to-F) modification programme is available.

An aircraft type with good payload weights and characteristics can expect to have a high percentage of its fleet modified. The best candidate aircraft will be those in the 'zone of convertibility' with a combination of: being at the right age; having the preferred number of accumulated flight hours (FH) and flight cycles (FC); being clear of any major modifications for an extended period; and being able to acquire engine and other technical support relatively inexpensively. Most important, however, is that the aircraft is available on the market at low enough market values for the total cost of converting it to freighter to be acceptably low. This only occurs when sufficient numbers of the type have been retired, and there is little interest for the type in other roles.

Aircraft have an estimated economic

life cycle. "The classic life of a widebody would be that a large mainline carrier takes original delivery of it, operates it for up to 20 years and then sells it for conversion to freighter, after which it is operated for 15 years. This means it has a 35-year economic life cycle. If the original aircraft is acquired from an operating lessor, there would be an initial 12-year lease, followed by an eight-year lease with another operator, and then conversion to freighter," says Tony Whitty, senior director, remarketing and ACMI at AirPartner.

In the case of used passenger and converted freighter options, important age rules in different jurisdictions of the world may therefore restrict the secondary market. The available markets for used widebodies are illustrated here.

The most likely fate for aircraft that do not have the optimum status for conversion to freighter, are in relatively poor maintenance condition, or for which there is little or no demand for freighter conversion or any other role, is to be dismantled for rotatable components and other equipment, and for acquisition of the engines. This is usually economic for the last portion of a type to be retired, or the poorer quality variants of a type that have engines and components that can be used by all. It will also often be the only option for aircraft that have low demand as used passenger aircraft and do not have a P-to-F programme available.

The engines will account for most of the aircraft's value. The amount will depend on their maintenance status, and market value as determined by demand and supply factors. Market values of used engines, and time-continued engine modules will move up and down for several years. They can help airlines operate fleets of used aircraft while avoiding some expensive engine shop visits (SVs).

To date, about 120 767-300ERs have been converted to freighter. This represents 20% of the passenger aircraft built. The demand for freighters in this size category means there is potential for large numbers of additional aircraft to be modified.

In other cases, the only option is permanent removal from service if there is no market for the aircraft or its components.

There are lessors who specialise in the secondary market and in part-out activities. “As commercial aircraft age, most of their value is in the engines. This is even more the case with widebodies, given the significant cost of overhauling and restoring their engines,” says Marc Cho, chief investment officer and president at L.I.F.T.

Despite the lack of liquidity of widebody assets, midlife lessors have found strategies to realise value in the used widebody market. It is not unusual for big lessors to dispose of a portfolio by tranching aircraft in the same age bracket and selling them to a specialised smaller lessor. “Success in the midlife/mature aircraft leasing sector relies heavily on managing cost versus value and optimising return on investment, especially given the large capital that can be tied up in the engines,” says Cho.

Widebody fleet

There are nearly 5,800 widebodies in active service worldwide, of which 4,667 are passenger aircraft, and just over 1,100 are freighters. There are also some 440 aircraft in storage. The total size of the widebody fleet is nearly 6,200 aircraft, including stored aircraft and freighters.

The active widebody fleet is highly concentrated in the Asia Pacific region with about 2,100 aircraft in operation or in storage.

The second largest widebody fleet is in Europe, with 1,400 aircraft. North America has an installed fleet of about 1,300 aircraft.

Smaller fleets are in the Middle East with 900, Latin-America with 195, and Africa with 231 aircraft. The average age of the widebody fleet worldwide is 11 years.

A300-600 & A310

This 200-250 seat category includes the A300-600, A310 and 767.

Few A300s and A310 remain in operation. There are 24 A300s in passenger configuration and 180 freighters; and 20 A310s in passenger configuration and six freighters.



All of the passenger A300/310 fleet currently operates in the Middle-East. The freighters are mainly operated by integrators in North America, accounting for 65% of the fleet, followed by Europe with 30%. The A300 family of aircraft has fully completed its economic life cycle.

The large number of A300-600s and A310s that have retired has put large numbers of PW4000-94s and CF6-80C2s on the used market, in addition to retired MD-11s and 747-400s. This supply of engines will assist airlines operating 767s.

A340-300

The A340-300 had limited success, since the market opted for the better economics provided by twin-engine types. There were 28 A340-200s and 219 A340-300s built. All A340-200s have been retired. There are 86 A340-300s still in commercial service. All the fleet is powered by the largest member of the CFM56 family, the CFM56-5C engine.

The A340-300 has only been acquired by second-tier passenger airlines for continued use, and there is no P-to-F conversion programme. Some aircraft have been acquired for component salvage and engine acquisition as they have been retired.

“We invested in the A340-300 three years ago when Cathay Pacific retired its fleet, because there was real value in supporting some airlines from an engine SV perspective with green-time CFM56-5Cs. This was due to other widebodies’ delayed entry into service,” says James Bennett, director of sales & marketing at Aerfin Limited. Operators are phasing out their A340-300 fleets, and investing

in this type is not an attractive option.

“From our perspective the only reason to now invest in the A340-300 is the degree of commonality of parts with the A330,” adds Bennett. This significantly reduces the market value of A340-300s.

Some aircraft have transitioned to the charter and ACMI sector and long-haul small operators like Spain’s Plus Ultra. But most remaining operators are phasing out the type.

Airlines that still operate the A340-300 have taken advantage of the type’s low market value. There is still a need for engine services, but the market value of a CFM56-5C is low, and there are few shops left that are able to support it. SR Technics and Air France have almost completely suspended their maintenance activities on these engines, while Lufthansa Technik still has remaining capability (*see MRO options for older & mature engine types, Aircraft Commerce, June/July 2018, page 50*). A typical SV for a CFM56-5C engine costs about \$1.5 million. The market value of a green time engine with about 1,000EFC remaining is \$500,000.

A340-600

Despite having similar capabilities to the 777-300ER, the A340-600 was heavy for its passenger capacity and more expensive to operate and maintain, and so had limited penetration in the market.

A total of 97 A340-600s were built from 2002 to 2010. Of these, 20 aircraft have already been retired, and 30 are in storage. Most of the operational fleet is in Europe with 51 aircraft. Lufthansa and Iberia are the largest operators. The third largest operator worldwide is South



African Airways, with seven aircraft in service and two in storage. The A340-600 has not been popular as a used passenger aircraft, so there is no P-to-F programme.

747-400

Nearly 690 passenger and freighter 747-400s were built following its introduction in 1988. Of those, 336 aircraft were powered by General Electric CF6 80C2 engines, 230 were fitted with the Pratt & Whitney PW4000-94 series of engines, and 126 were powered by Rolls-Royce RB211-525H engines.

More than 300 747-400s have been retired, most of them passenger aircraft. There are 147 factory-built freighters with nose-loading capability, and 86 conversions. This is a total of 233 aircraft in freighter configuration, with 214 are still in operation.

There were 440 aircraft built in passenger configuration, and 162 freighters were also produced. To date, 88 passenger aircraft have been converted to freighter, equal to 20% of the passenger fleet.

The remaining fleet of 118 passenger-configured 747-400s is a fraction of the original numbers built. British Airways (BA) is the largest operator of the passenger version, with 32 still in service. Other main operators are Lufthansa (13), Rossiya (9), Thai International (80), Saudia (7), Virgin Atlantic (7) and KLM (4).

The largest freighter fleet is in North America, with 87 747-400 freighter, and 36 of these are converted aircraft. The average age of the 747-400 fleet is 20 years. A high number of 747-400s are in

storage, with 53 out of service.

There was big demand for 747-400 freight conversion, but this ceased in 2014. Israel Aircraft Industries (IAI) says that its freighter conversion could still be available if required. Conversions ceased partly because the 747-400 freighter's four-engine configuration made its economics relatively poor.

If a cargo operator requires an aircraft with a nose-loading capability, the only option is the factory-built 747-8F, which is still in production.

Nonetheless there remain 115 passenger aircraft in operation. "Operators of 747-400s are undertaking a retirement plan based on the green time of their engines. Airlines are now unlikely to overhaul engines on ageing aircraft," says Whitty. "Green time or time-continued engines will be swapped for those with no remaining maintenance life. This will determine how many aircraft can continue to be operated, and for how long with the green engines left in the fleet. It is the same for all other parts on the aircraft, and operators can be self-sufficient for the last few years of the fleet's operation."

There is no demand for used passenger aircraft or freighter conversions. Converting a 747-400 to a freighter does not offer a significant competitive advantage over factory-built freighters like the 777-200LRF that offer similar mission capabilities, but have a longer economic life cycle.

"The demand for PW4000-94s and CF6-80C2s comes from the freighter market. This drives market values, since there is no demand from the passenger market," says Bennett. "We support

In recent years, freighter modifications of 767-300ERs has been stimulated by demand from Amazon Air. A large number of A300 and A310 freighters are due to retire over the next five to 10 years, and this will maintain demand for 767 freighter modifications.

aircraft that have already been converted so that these fleets can continue to operate. We know that the RB211-524 on the 747-400 fleet has a limited shelf life. There is only a handful of operators left. We are working with some of them to support the engine's SV activities. There is support activity for the parts on the engines, but it is a niche market."

767-300ER

More than 1,100 examples of the 767 family have been built. The stretched 767-300ER became the most popular, with more than 850 aircraft built to date.

Some 250 baseline 767-200 aircraft were built. There are fewer than 40 units of the larger 767-400 that operate exclusively with North American carriers.

The 767-300ER is the only variant still produced, mainly in freighter and tanker roles. The backlog is about 100 aircraft.

There are nearly 70 767-200 aircraft in active service worldwide, mainly as freighters. The fleet is highly concentrated in North America with more than 40 aircraft, and the rest of the fleet is mainly based in Europe. Most are operated as converted freighters and are close to retirement age.

The 767-300 series is split between the -300 and the longer range and higher gross weight -300ER. There were 104 -300s built, and 14 remain in operation. There is little or no interest in these aircraft for continued operation, while part-out value will depend on the demand for their engines. Of 14 aircraft, 13 are equipped with CF6-80C2 engines, which may interest 767-300ER operators.

More than 760 767-300ERs have been built to date. So far, 169 factory-built freighters have been delivered, all with CF6-80C2 engines.

Of the 593 other aircraft, 11 were VIP and special configuration, and 582 were passenger-configured. Of these, 120 were converted to freighter, equal to 21% of the fleet.

There are 346 passenger-configured aircraft left in service. About 205 are equipped with CF6-80C2 engines, while 184 are powered by PW4000-94 engines, and six are equipped with RB211-524s.

The half-life market value of a 15-year-old 767-300ER is \$10-12 million. This type of asset would interest a very small operator with a bad credit rating. It is also a good candidate for conversion.



To date there have been 120 freighter modifications, and a further eight aircraft are scheduled to be converted in 2020. The number of 767-300ERs converted over the past few years was 24 in 2017, 27 in 2018, and 14 in 2019. The conversion cost is \$13-15 million.

Nearly 170 767-300ERs have been retired, and there are about 40 in storage.

It was Prime Air in fact that stimulated the conversion market. It took six of the 14 767-300ERs converted in 2019, and has taken 48 converted -300ERs over the past five years. Some of them are on very short-term leases.

Most conversions undertaken over the past five years have been 767-300ER conversions, a total of 87 since the start of 2015. This compares to eight A300, three A330-200s and three A330-300s during the same period.

“Factory-built 767 freighters are still in production, but all are on order with FedEx. When the 767 production line transitions to the Air Force Tanker, there will be no further commercial versions available, although there was some talk about keeping a commercial line going. But there is no confirmation of that,” says Jep Thornton, managing partner at Aerolease Aviation. “As far as older aircraft are concerned, there is still a demand for 767-300 freighter conversions by the E-commerce players. The legacy US carriers will keep operating their 767 fleets for the time being. The question is whether there will be any life left in them once they come out of those fleets,” adds Thornton.

An interesting fact is that most converted 767 aircraft have remained in the same jurisdiction and have not been re-registered in another country. This is partly due to age restrictions.

There are 18 767-300ER scheduled to be converted in 2020, and there is a huge potential conversion in the next five years for aircraft in good maintenance condition and values between \$10 to \$12 million.

“There is still demand for conversion of 767s into freighters, which is what will sustain the value for both the PW4000 and CF6-80C2. But in that area we see more potential in the engines than in the aircraft itself,” comments Bennett.

The current fleet of freighters in the same category as the 767-300ER totals more than 800 units. Nearly 600 are likely to retire over the next 20 years. In addition, the fleet of freighters in this size group will also have to grow by several hundred units to meet growing demand. This clearly means that large numbers of 767-300ERs could be modified to meet demand.

The A300 has mainly transitioned to the freighter role, but the 767 is still in active service in large numbers with mainline carriers, particularly with the three big US carriers. “The three big US carriers are willing to operate 25-year old 767-300 fleets because for them the capital cost is zero,” says Whitty. “They only need to keep investing in upgrading the interiors. They are able to operate them for longer periods than other airlines outside North America.

“It makes economic sense for US operators to retain these fleets. The trigger to retire a 767 is the cost of engine maintenance.”

Replacement of these fleets has already started. There are 33 A330neo aircraft on order with US operators, plus 22 787-8s, 40 787-9s and 60 A350-900s for delivery to the three big legacy carriers in the US.

The used market prospects for the A330-200 and -300 are largely untested, but engine type will have a big influence on level of interest from potential buyers. The A330-300 has a high volumetric capacity following conversion to freighter.

If an engine is due a heavy SV, at least some of the LLPs will require replacing, and if the airframe is also due a heavy airframe check then the best option is to retire the aircraft. Engines with maintenance life remaining can be swapped to aircraft with maintenance life remaining as a process of gradually phasing out a fleet.

Like the A300 family, the 767 has completed its entire economic cycle.

A330 family

The A330 programme was conceived as a medium-range, twin-engine version of the A340-300, and initially had transcontinental capabilities. The A330-300 underwent several improvements, including increased maximum take-off weight (MTOW), larger fuel tanks, and incremental extended-range twin engine operational performance standards (ETOPS) to extend its mission capabilities.

The development of the shorter A330-200 and long-range series allowed the A330 family to meet demand across the medium-size, long-haul widebody market with 230-290 seats.

More than 1,400 A330-200s and -300s have been built since its inception in 1994. The current operational fleet is more than 1,300 aircraft, of which 593 are A330-200s and 725 A330-300s.

About 80 aircraft have been retired from service, and there are almost 100 in storage, of which 65 are A330-200.

Most of the fleet (830 aircraft) is powered by Trent 700 engines, followed by about 290 fitted with the CF6-80E1, and 201 with the PW4000-100 series.

Incremental performance improvements to the A330 family, the -300 variant in particular, challenged the 767-400ER and 777-200/-200ER programmes.

The A330 variants are third generation aircraft. The A330-300 had great success in the Asia Pacific, while the 777-200ER series captured more market share in North America and Europe.

The A330 was particularly successful in the Asia Pacific, with almost 600 aircraft in service at an average age of nine years. There are 410 A330-300s. The largest fleet is operated in China, with more than 320.

Europe has the second largest A330 fleet, with more than 350 aircraft and an

average age of 10 years. There are 170 A330-200s and 180 A330-300s.

The A330 North American fleet comprises nearly 140 aircraft: 80 -200s and 60 A330-300s. The average age is 11 years.

There are nearly 120 A330s in the Middle East, split evenly between -200s and -300s. The average age of the fleet is 10 years.

“There are about 100 A330s parked, which are not old. Remarketing them is taking a long time. After receiving a mandate to place an A330, it has been parked for well over a year,” says Whitty.

“The problem with the A330 is that there have been high-profile airline failures recently. WOW, Thomas Cook, Air Berlin, Avianca Brasil, XL Airways and Aigle Azur all operated A330 fleets. These failures resulted in an oversupply of available A330s,” continues Whitty. “It would have been expected, however, that some of the A330s would have been placed with legacy A330 operators, but this has not happened. It was actually ACMI and charter operators like GetJet, Wamos and HiFly that have reduced the inventory of aircraft. Because these airlines do not operate their aircraft for a fixed number of FH per year, a lot of wet lease deals are at low lease rates. Lessees pay more if they fly more, which is more on a power-by-the-hour (PBH) basis, than

a typical lease deal. A330 lease rates have gone from \$340,000 to \$210,000-250,000 in the last year for a 10-year old aircraft,” adds Whitty.

The half-life market value of a 10-year-old A330-300 fitted with Trent 700 engines is now about \$30 million. If the engines are enrolled this value can be affected. Nevertheless, due to the excess supply of A330 aircraft, the engine manufacturer has started to let operators undertake their maintenance with third-party suppliers. The market value of a second run Trent 700 engine is \$9-10 million.

The conversion cost of the A330-200 and -300 is estimated at \$17 million.

This softness in the market is compounded by operators like TAP Portugal and Aer Lingus that are now deploying narrowbodies instead of widebodies on transatlantic operations. “The A321XLR is eating into the widebody market where previously you may have seen a used A330 being placed,” says Whitty.

The A330 freighter conversion has just started, but only in quite small numbers for DHL. The number of conversions will need to ramp up a lot to reduce the inventory of available A330s. The conversion programme will not take significant numbers in the current market.

The A330 P2F programme was

launched in 2015, but the first conversion took place in 2017 with the first A330-300P2F commencing services for DHL in December that year. At the moment the only widebody conversion programmes are in the 40-80-tonnes category. Aircraft in this range are the 767-300ER and the A330-300 and A330-200. It is estimated that the market will require at least 350 aircraft in this category over the next 10 years.

There is an established operator base for the A330. “This is a very challenged aircraft, but it performs well on long routes,” adds Jep Thornton, managing partner at Aerolease Aviation.

Airbus produced many aircraft and was able to introduce large fleets with operators in Asia Pacific and Europe at values that were convenient for both the manufacturer and the operators. The inventory levels are high, but the A330 is regarded as an easier aircraft to introduce into a fleet than members of the 777 family.

The prospects in the used market for the two A330 series are different. “Within the A330 family of aircraft, the A330-200 is becoming more of a challenge to place than the -300,” says Andy Coupland, chief executive officer at Aircraft Analytics. “Progressive operating weight increases have rendered the A330-300 the variant of choice for operators,

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since the payload-range performance of both types is now similar, whereas the operating economics quite strongly favour the longer -300. This is a situation analogous to the A321 versus A320, or A320 versus A319.”

When engines are enrolled in a corporate maintenance programme, this liquidity is eroded. “Most of the A330-300 Trent 700 fleet is enrolled in a maintenance program. A lot of these agreements are not transferable, so the liquidity of the entire airframe is affected,” says Alun Roberts VP of Engines at AJW Group.

“There has always been concern about investing in Rolls-Royce-powered products for the A330, because this market has been completely ring-fenced by the original equipment manufacturer (OEM),” says Bennett. “There has been a change on the Trent 700, however. TS&S in Abu Dhabi is now an authorised maintenance centre to support that product line, which makes you think that the OEM is opening up for more competition. We are not investing in the Trent 700, but the OEM has engine shop capacity constraints because the A330 fleet is large. If Rolls-Royce gives more independence to the programme over the coming years, it may make this engine a more attractive proposition. We are not investing yet, but we are tracking that market.”

777 family

The 777 programme comprises five passenger variants: the basic 777-200, the 777-200ER, the larger 777-300 and 777-300ER and the ultra-long-range 777-200LR. More than 1,440 of these five

passenger-configured variants were built.

The 777-200LRF is the factory-built freighter variant.

The production of passenger-built variants comprises: 88 -200s, 417 -200ERs, 60 -200LRs, 59 -300s and 816 -300ERs. Of these about 80 have already been retired. About 50% of the retired fleet remained with their original operators. The remaining aircraft were involved in transactions with subsequent operators and ultimately were acquired by part-out companies.

The options in the secondary market for the 777-200/-200ER and the basic 777-300 are limited. The market for the 777-200 is even more challenging in the absence of a freighter conversion programme, and many of these aircraft have already passed the conversion threshold.

“We traded three Kenya Airways 777-200ERs starting in 2016, but each one depreciated by 30% every year,” says Whitty.

The 777-200ER is too large for the needs of some operators with small fleets. “Many 777-200ERs are being scrapped. There is value in the engines and in some of the components, but the main issue with the 777-200ER is the cost of the interior reconfiguration,” adds Thornton.

For specialised mid-life companies, the aircraft is not an attractive asset. “Our acquisition strategy is based on where we can see commonality across platforms. This provides the potential market for components and engines. An example is commonality between the A340 and the A330. We cannot see any level of commonality between the 777-200 and other long-range members of the family. It is a huge investment, so it is not

While initially very popular as a long-haul workhorse, the 777-200ER has proved unpopular and in low demand in the used market. A large portion of retired aircraft have had to be parted out.

an area we are currently looking at,” concludes Bennett.

From the point of view of a buyer, a 777-200ER in half-life maintenance condition has a market value of \$15-18m. The typical cost of reconfiguration is \$10-12 million. Very few operators would be interested in this type of transaction.

A European operator recently reconfigured an aircraft in the family to a high-density configuration. “This cost \$10 million,” comments Whitty. “There are large 777-200ER fleets still operating in North America and Europe, and ageing aircraft will have to be retired or replaced with new generation aircraft.”

The options for part-out are also limited. “There are few options for the owner of a 777-200ER. In respect to part-out, the engines and heavy components of the first aircraft of any given type to be parted out will usually command high prices, but the demand for such components and spare engines will be satisfied by the remaining operational fleet relatively quickly. The economics of the part-out market will become less attractive thereafter,” says Coupland.

The 777-300 had limited success, with only 60 units built until 2006. The certified MTOW of the aircraft does not make it a good candidate for freighter conversion.

The 777-300ER’s capacity and twin-engine configuration gave it a competitive operating cost performance over the A340-600, and made the 777-300ER the long-haul workhorse. It has replaced most 747-400s.

More than 810 777-300ERs have been built since 2004. The largest 777-300ER fleet is in the Asia Pacific region, with nearly 365 in service. The Middle East has the second largest fleet with about 245, and the European fleet has 157. Aircraft are operated by flag carriers such as BA, KLM and Air France. There are 21 aircraft in Africa, and only 10 in Latin America, all with LATAM Brazil.

Opportunities for remarketing aircraft have been found in the largest types, which have the lowest levels of liquidity. “There is a good degree of commonality between the 777-200LR and the 777-300ER. Some part-outs have occurred on the 777-200LR, but this only involved its components. Since a high percentage of these engines are enrolled with the OEM’s

The 777-300ER has a passenger-to-freighter conversion programme available from IAI. It will have a gross structural payload of just over 100 tons. This makes the type the only aircraft with a payload close the 747-400F. The 777-300ER was built in large numbers, and so may be well placed for the large widebody freighter sector.

and maintenance & repair organisation's (MRO's) maintenance care agreements, it is still a challenging market for parting out the engine's internal components," says Alun Roberts, vice president of engines at AJW Group. "When we look at the 777, we put a value on the engines from a green-time aspect with the inclusion of residual value on external components. We value the airframe and the parts."

"The 777-300ER is a good aircraft, but it is larger, and more expensive to maintain and operate than the A330. The 777-300ER's fuel burn is higher than the A350-1000's. With the 777-9X's delays, large operators in the Middle East have extended their leases for up to three years. This has eased pressure, because some 777-300ERs were coming on to the used market," comments Whitty.

The value and quality of feedstock is also a factor "If an aircraft with a market value of \$50-60 million comes back from lease and is a suitable conversion candidate, the decision to convert it has to be assessed in detail, given the cost of conversion is \$35 million at list price," adds Whitty. "The total build and prepare-for-service cost would be in excess of \$80 million". This total cost will drop significantly, however, when the number of available aircraft increase beyond more than about 30 units.

"FedEx placed an order for 50 777-200LRF factory-built freighters. It is unlikely that they are paying more than \$90 million per aircraft. It also has to be considered that a factory-built aircraft will always have advantages over a converted aircraft. The -200LRF does, however, have a 20% smaller freight volume than the converted -300ER."

So far there have been no more than 20 transitions of 777-300ERs between operators. "There may be limited demand for passenger 777-300ERs after lease or lease extensions. There are operators, like Air Atlanta, who need to replace old fleets, with high-capacity aircraft in high-density configuration. Potentially, if the 777-300ER comes down to a certain value, some of the three big US carriers may acquire 10-20 sisterships. This would only happen when the market is at the right price, but it will absorb some of the fleet," concludes Whitty.

The conversion cost of the 777-300ER is high, so it will only be converted if the purchase price of

feedstock declines to an acceptable level, and if there is demand for widebody freighters," adds Thornton. The market for widebody freighters has been softer in the past few years than the narrowbody market. "The cargo market does not need any more widebody capacity at this time," says Thornton.

According to Bennett: "The 777-300ER is a huge investment for what is as yet an untested market. There is potential, but this will not be realised for at least five years."

The most important of a freighter's design weights are the operating empty weight (OEW) and the zero-fuel weight (ZFW). During the process of conversion, reducing the OEW is important because of the resulting increase in payload. The ZFW is important because it determines the maximum structural payload. The success of the GECAS and IAI partnership on the 777-300ER freighter conversion programme partly depends on being able to reduce the OEW as much as possible, and to arrive at a payload that gives the aircraft similar or better economics than current freighters. IAI has a good record of optimising design weights with previous conversion programmes. The partnership estimates that demand for the type will be about 175 converted 777-300ER freighters; about 20% of the aircraft built.

In summary

Remarketing widebody aircraft is a big endeavour. Large lessors have one big advantage when remarketing widebody aircraft. The economies of scale resulting from the size of their massive fleet allows them to seal deals where they transfer a fleet of narrowbody aircraft to an

operator and tie a widebody into the deal. The market conditions for used widebody market in general are soft, with limited prospects. A good example is a carrier like Biman Bangladesh, that may have been expected to access the used market to cater for its long-haul fleet requirements, but instead chose new-build 787-9s.

The future options for the 767-300ER aircraft are mainly conversion to freighter, and to remain in service with the big legacy carriers in the US. The A330 is currently at a crossroads because the inventory levels are high. There is likely to be the opportunity in the conversion market to consecutively replace large numbers of the 767-300F fleet in the medium- to long-term. There will be also further opportunities when market values reach levels that make A330s an attractive option for established operators of the type.

The 777-200ER has few used market opportunities. Most of the fleet will be eventually parted out once operators conclude it is no longer economic to perform major maintenance on the aircraft. The 777-300ER has a good established operator base and depending on how the global economy performs in the next decade, up to a quarter of the fleet could find a second role in the freighter sector. There would be also alternative scenarios where a fleet of sisterships becomes available in the market and some North American carriers could be interested in acquiring those aircraft when at an attractive price. This still potentially leaves **AC** large



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