While few freight airlines are acquiring new fleets, market values of used passenger aircraft have declined. The costs of acquiring used A300-600Rs, A310-300s, 767-200ERs & 767-300ERs and preparing them for service as freighters are analysed.

The costs preparing medium widebody freighters for service

The current global economic downturn has resulted in over-capacity of passenger aircraft. As a consequence of airline fleet restructuring programmes, the availability of used medium-widebody passenger aircraft has increased and weakened their market values. This is particularly true with the A300-600R and A310-300. Reduced values may make acquiring them for conversion to freighter more attractive, although few freight operators are considering fleet renewals. Medium widebody types that freight carriers would consider for operation are specifically the A300-600R, A310-300, 767-200ER and 767-300ER.

The costs of acquiring these used types, converting them to freighter and installing a cargo loading system, performing bridging maintenance, and bringing the aircraft to an acceptable standard for service are examined here. These costs are considered in relation to market lease rates and potential demand for the aircraft. The four types' payload characteristics and accommodation capacities are also considered.

Aircraft types & availability

The global fleets of A300-600Rs and A310-300s are small compared to the 767-200ERs and 767-300ERs. The A300-600R and A310-300 entered service in 1988 and 1986. Much of the fleets of both types have migrated from primary operators to new airlines.

American Airlines has the largest A300-600R fleet of 33 aircraft. However, as part of its fleet reorganisation plan it has already parked 12 aircraft, and will park the remaining 21 by the end of 2009. It owns 10 aircraft, and will put these up for sale later this year. The balance of the fleet is leased from several lessors via Airbus, and American will continue to pay the lease rentals on these aircraft until their leases expire during 2010-2013. This will steadily increase the supply of aircraft over the period.

Other major fleets that are likely to increase the supply of available A300-600Rs are Lufthansa's and Thai International's. Lufthansa had a fleet of 13, five of which have been sold to another passenger operator. The remaining eight are likely to be retired over the next few years.

Thai International's fleet of 17 aircraft is also likely to come on to the market in the next few years. These could take the number of available A300-600Rs to more than 30 by the end of 2009 or during 2010.

Aircraft from these three fleets are the better freighter conversion candidates. Korean Air, for example, has a fleet of eight, but these have accumulated a high number of flight cycles (FC), so they are less attractive conversion candidates.

The A310-300 fleet is more fragmented, and fewer aircraft are with their original operators. The active passenger fleet totals 82, and the largest fleets are with Air India (9), Air Transat (14) and Pakistan International (14). There are also several small fleets of used aircraft operated by airlines in the CIS.

The 767-300ER and the 767-200ER

The availability of used A300-600Rs will increase sharply with the decision by American Airlines to park its entire fleet of 33 aircraft. Lufthansa also has eight which may be retired over the next few years, and Thai International's fleet of 17 are also likely to come onto the market.

A300-600R & A310-300 FREIGHTER MODIFICATION SPECIFICATIONS

Aircraft type	A300-600RF	A310-300
Converter	EADS-EFW	EADS-EFW
MZFW-lbs	286,600	249,120/251,320
OEW-lbs	179,230	162,920
Gross structural payload-lbs	107,370	86,200/88,400
Maindeck containers	21	16
Container type	88" X 125"	88" X 125"
Unit volume maindeck container-cu ft	476	476
Total volume maindeck containers-cu ft	9,996	7,616
Tare weight maindeck containers-lbs	5,313	4,048
Lowerdeck LD-3 containers	22	14
Unit volume LD-3 containers-cu ft	146	146
Total volume LD-3 containers-cu ft	3,212	2,044
Tare weight lower deck containers-lbs	4,730	3,010
Total volume all containers-cu ft	13,208	9,660
Total tare weight all containers-lbs	10,043	7,058
Net structural payload-lbs	97,327	79,142/81,342
Packing density-lbs/cu ft	7.36	8.19/8.42

in particular are still popular with their original operators because of the delay to the 787, a shortage of A330-200s, and the fact that the 767-300ER is the only aircraft in its size and range class. The availability of 767s is likely to increase once 787 deliveries get under way during 2010-2013.

The active passenger-configured 767-200ER fleet totals 71 aircraft. Many are now operated in small fleets, with aircraft having been sold by their primary operators. The largest first-tier fleets are those of American (15), Avianca (5), Continental (10) and USAirways (10). There are also small original fleets operated by Aeromexico, El Al and Mexicana. Apart from Continental's aircraft, all were built prior to 1993.

There are also a large number of parked or stored-200ERs, such as Air Canada's fleet of 18, which has been grounded for several years.

The passenger-configured 767-300ER fleet totals 479 active aircraft and another 32 parked ones. The largest fleets of aircraft built prior to 1995 are Air Canada (22), American (37), Condor (9), Delta Airlines (20), Martinair (6), Qantas (15), Royal Brunei (6), Transaero (8) and USAirways (21). There are also numerous small fleets. In addition, British Airways and Qantas operate another 23 older aircraft equipped with Rolls-Royce RB211-524H engines. These are less likely to be of interest as potential freighter conversion candidates, however, because of their higher OEWs compared to the more numerous Pratt & Whitney- and GE-powered aircraft.

The current increased availability of 767-300ERs is likely to push their values down to levels that makes conversion to freighter economic. The 767-300ER's superior payload and range over the A300-600R is likely to reduce interest in freighter conversions for the type.

Interest in the 767-200ER is likely to be limited, because its payload is smaller than the 767-300ER.

There are 11 parked 767-200ERs and some others that are available. Several aircraft are in operation, but are now available, such as El Al's two aircraft.

Many parked aircraft are beyond economic repair, however, and many are high-time aircraft. This makes it hard to justify $10-13 million for a freighter modification. A larger number of younger -200ERs will become available in the future.

Other 767-200ERs and -300ERs are technically not available, but could become so, since their operators are at risk from failure. The current values of 767-200ERs are $10-$15 million, depending on maintenance condition.

There are currently 18 767-300ERs available for sale or lease. This includes eight aircraft that have high gross weights and were manufactured in the late 1980s. Like the -200ER, the supply of -300ERs is likely to increase in the short-term.

Payload capacity

A300-600RF

There are two providers of passenger-to-freighter conversions for the A300-600R: EADS-EFW and Flight Structures Inc. The EADS-EFW modification is performed at Dresden, Germany and takes about four months to complete.

The modification gives the two aircraft a maindeck cargo door 141 inches wide and 101 inches deep. This is the same as for the factory-built A300-600F. The maindeck floor is also strengthened, windows are plugged, and passenger doors deactivated. The aircraft are fitted with a safety barrier net.

The A300-600R and A310-300 accommodate LD-3 containers in pairs in the belly section. The A300-600R can carry 12 LD-3s in the forward hold and 10 LD-3s in the aft hold. These each have an internal volume of 146 cubic feet, and so provide a total of 3,212 cubic feet *(see table, this page)*. The combined tare weight of the 22 containers is 4,730lbs.

There are several maindeck container and pallet configurations for the A300-600R. One example is a single row of 88-inch or 96-inch pallets, or 96-inch X 125-inch AMA containers.

The configuration that maximises the contours of the aircraft's fuselage, and so provides the highest volume, is nine pairs of 88-inch X 125-inch containers and three of these containers in a single row. Each of these 21 containers has an internal volume of 476 cubic feet, providing a total maindeck volume of 9,996 cubic feet. Their combined tare weight is 5,313lbs *(see table, this page)*.

The total containerised volume is 13,208 cubic feet, and container tare weight is 10,043lbs. Following conversion, the A300-600RF has a maximum zero fuel weight (MZFW) of 286,00lbs, and an operating empty weight (OEW) of 179,230lbs. This gives the aircraft a gross structural payload of 107,370lbs.

Once container tare weight is deducted, the aircraft therefore has a net structural payload of 97,327lbs and a maximum packing density of 7.36lbs per cubic foot *(see table, this page)*. This is similar to packing densities of most general freight types, and higher than express packages.

A310-300F

EADS-EFW is the only provider of a passenger-to-freighter conversion for the A310. The A310-300 has the same fuselage cross section as the A300-600R, but the shorter A310-300 can carry 14 LD-3s in its belly, giving it 2,044 cubic feet and a belly container tare weight of 3,010lbs.

The maindeck can accommodate eight pairs of 88-inch by 125-inch containers. These provide a total volume of 7,616 cubic feet and have a tare weight of 4,048lbs. The total containerised payload capacity of the aircraft is 9,660 cubic feet and a container tare weight of

7,058lbs *(see table, page 71)*.

Following conversion to freighter, the aircraft has two MZFW options of 249,120lbs and 251,320lbs, and an OEW of 162,920lbs. This gives the aircraft a gross structural payload of 86,200lbs and 88,400lbs *(see table, page 71)*.

The net structural payloads are thus 79,142lbs and 81,342lbs, allowing maximum packing densities of 8.19lbs per cubic foot and 8.42lbs per cubic foot *(see table, page 71)*. This is higher than its larger A300-600RF counterpart.

767-200ER

There are two passenger-to-freighter conversion programmes for the 767-200ER, offered by Boeing-Aeronavali and IAI Bedek Aviation.

The Boeing-Aeronavali modification is an amended type design of the original passenger-configured aircraft, with the modification being provided by the original equipment manufacturer (OEM). The conversion is a Boeing modification, and the conversion work is performed by Alenia Aeronavali. The modification offers an upgrade of all aircraft systems to the latest configuration for the 767, so system components are upgraded to the latest part and dash numbers.

The converted 767-200ER has an MZFW of 266,000lbs, an OEW of 164,600lbs and a gross structural payload of 101,400lbs.

The conversion to freighter provides a 134-inch by 103-inch maindeck cargo door, which is the same size door as the Boeing production freighter. The modification has a list price of $13.0 million.

The aircraft can accommodate 20 88-inch by 125-inch containers on its maindeck. The standard container has an internal volume of 502 cubic feet, and the aircraft can carry 18 of these. Two smaller containers are carried at the rear of the aircraft, and each have an internal volume of 420 cubic feet. The 20 containers provide a total volume of 9,876 cubic feet. They also have a unit tare weight of 240lbs, and so have a combined tare weight of 4,800lbs.

The 767-200 has a narrower fuselage than the A300 and A310, which prevents it from carrying pairs of LD-3s in its belly. It therefore has to carry pairs of smaller LD-2s, which each have a volume of 124 cubic feet and tare weight of 203 cubic feet. The 767-200 can accommodate 22 in its belly, so the aircraft has a total belly volume of 2,728 cubic feet and tare weight of 4,466lbs.

The total containerised volume provided by all containers is thus 12,604 cubic feet, which have a total tare weight of 9,266lbs. The aircraft has a net structural payload of 92,134lbs, and maximum packing density of 7.3lbs per cubic foot *(see table, this page)*.

767-200ER FREIGHTER MODIFICATION SPECIFICATIONS

Aircraft type	767-200ER	767-200ER -BDSF
Converter	Alenia Aeronavali	Bedek Aviation
	Barrier	Safety net
MZFW-lbs	266,000	258,000/266,000
OEW-lbs	164,600	164,400
Gross structural payload-lbs	101,400	93,600/101,600
Maindeck containers	20	19
Container type	88-inch X 125-inch	88-inch X 125-inch
Unit volume maindeck container-cu ft	502/494	502
Unit tare weight maindeck container-lbs	240	240
Total volume maindeck containers-cu ft	9,876	9,538
Tare weight maindeck containers-lbs	4,800	4,560
Lowerdeck LD-2 containers	22	22
Unit volume LD-2 containers-cu ft	124	124
Total volume LD-2 containers-cu ft	2,728	2,728
Tare weight lower deck containers-lbs	4,466	4,466
Total volume all containers-cu ft	12,604	12,266
Total tare weight all containers-lbs	9,266	9,026
Net structural payload-lbs	92,134	84,574/92,574
Packing density-lbs/cu ft	7.3	6.9/7.5

The Bedek Aviation supplemental type certificate (STC) for the 767-200/-200ER conversion has already been used to convert 38 aircraft. Converted aircraft are designated the 767-200BDSF. These include 19 aircraft for ABX, four for Tampa Air Cargo, and 11 for Danish carrier Star Air. The conversion has a basic price of $10.0-10.3 million.

The 767-200ER will be the aircraft most freight operators have a potential interest in because of its range capability. With a fuel capacity of 24,140 US Gallons (USG) it can carry a full payload up to 3,200nm.

There are many MTOW weight variants of the 767-200ER, ranging from 335,0000lbs to 395,000lbs. Bedek Aviation can offer an upgrade for the MTOW, and can take all aircraft modified with its STC to the highest MTOW option of 351,000lbs.

There are also several MZFW specification weights. Bedek Aviation also offers upgrades for these during conversion, and the two options are 258,000lbs and 266,000lbs *(see table, this page)*. The cost of the upgrades varies from $200,000-500,000 according to the specification of the original aircraft.

The aircraft also has an OEW of 164,400lbs, giving it a gross structural payload of 93,600lbs and 101,600lbs, depending on MZFW specification weight *(see table, this page)*.

The 767-200BDSF uses a safety net, and consequently the maindeck can utilise a variety of containers and pallets, but the type that makes the most use of the fuselage's contour are the 88-inch wide by 125-inch containers. The aircraft can carry 19 of these. These each have an internal volume of 502 cubic feet and a tare weight of 240lbs. They therefore provide a combined volume of 9,538 cubic feet and have a total tare weight of 4,560lbs *(see table, this page)*.

The aircraft therefore has a total containerised volume of 12,266 cubic feet and tare weight of 9,026lbs. This allows it to have a net structural payload of 84,574lbs or 92,574lbs, depending on MZFW specification *(see table, this page)*. This gives the aircraft a maximum packing density of 6.9lbs per cubic foot and 7.5lbs per cubic foot.

767-300ER

There are two passenger-to-freighter conversion programmes for the 767-300/-300ER. These are offered by Bedek Aviation and Boeing CAS.

The STC for Bedek Aviation's conversion is expected to be issued in the third quarter of 2009. The designation for aircraft converted by Bedek is a suffix of -BDSF.

The 767-300BDSF will use a safety net, while the 767-200ERBDSF will use a rigid barrier at the front of the fuselage.

The 767-300BDSF will have an MTOW of 350,000lbs, which is the

767-300/-300ER FREIGHTER MODIFICATION SPECIFICATIONS

Aircraft type	767-300 -BDSF	767-300 -BCF	767-300ER -BDSF	767-300ER -BCF
Converter	Bedek Aviation	Boeing CAS	Bedek Aviation	Boeing CAS
	Safety net	Rigid barrier	Rigid barrier	Rigid barrier
MZFW-lbs	278,000	278,000	309,000	295,000
OEW-lbs	179,000	182,900	183,500	184,100
Gross structural payload-lbs	99,000	95,100	125,500	110,900
Maindeck containers	23	24	24	24
Container type	88-inch X 125-inch	88-inch X 125-inch	88-inch X 125-inch	88-inch X 125-inch
Unit volume maindeck container-cu ft	502	502	502	502
Unit tare weight maindeck container-lbs	240	240	240	240
Total volume maindeck containers-cu ft	11,546	12,048	12,048	12,048
Tare weight maindeck containers-lbs	5,520	5,760	5,760	5,760
Lowerdeck LD-2 containers	30	30	30	30
Unit volume LD-2 containers-cu ft	124	124	124	124
Total volume LD-2 containers-cu ft	3,720	3,720	3,720	3,720
Tare weight lower deck containers-lbs	6,090	6,090	6,090	6,090
Total volume all containers-cu ft	15,266	15,768	15,768	15,768
Total tare weight all containers-lbs	11,610	11,850	11,850	11,850
Net structural payload-lbs	84,066	79,672	110,072	95,472
Packing density-lbs/cu ft	5.5	5.0	7.0	6.0

highest possible for the 767-300. The converted aircraft will also have an MZFW of 278,000lbs, and an OEW of 179,000lbs. The aircraft will therefore have a gross structural payload of 99,000lbs *(see table, this page)*.

The 767-300BDSF's safety net means that it will only be able to accommodate 23 88-inch by 125-inch containers on its maindeck. These provide a containerised volume of 11,546 cubic feet and have a tare weight of 5,520lbs.

The aircraft's lower deck can carry a total of 30 LD-2 containers, which provide a volume of 3,720 cubic feet and have a tare weight of 6,090lbs. The total containerised volume on the aircraft is therefore 15,266 cubic feet and tare weight is 11,610lbs. This gives the aircraft a net structural payload of 84,066lbs and a maximum packing density of 5.5lbs per cubic foot *(see table, this page)*.

The 767-300ERBDSF has a higher MZFW of 309,000lbs and an OEW of 183,500lbs, giving it a gross structural payload of 125,500lbs *(see table, this page)*. The aircraft also have an MTOW of up to 412,000lbs.

The -300ERBDSF uses a rigid barrier so it can accommodate 24 containers on its maindeck. These give a total volume of 12,048 cubic feet and have a tare weight of 5,760lbs. The aircraft can carry the same number of LD-2s in its belly space as the -300, so the -300ERBDSF has a total containerised volume of 15,768 cubic feet and container tare weight of 11,850lbs. This results in a net structural payload of 110,072lbs and maximum packing density of 7.0lbs per cubic foot *(see table, this page)*.

The conversions of the 767-300 and -300ER under the Boeing CAS programme are designated the -300BCF and -300ERBCF. The two variants have the same container accommodation as the -300ER under Bedek's conversion.

The -300BCF and -300ERBCF both use a safety barrier, and so can accommodate 24 88-inch by 125-inch containers on the maindeck. The -300BCF and -300ERBCF overall have the same containerised volume and container tare weight as the -300BDSF.

Aircraft modified by Boeing's conversion programme have lower weights than the Bedek-converted aircraft. The -300BCF has an MZFW of 278,000lbs, an OEW of 182,900lbs and a gross structural payload of 95,100lbs. This compares to 99,000lbs for the -300BDSF *(see table, this page)*. This lower gross payload results in a lower net payload of 79,672lbs.

The 767-300ERBCF has an MZFW of 295,000lbs, an OEW of 184,100lbs, and a gross structural payload of 110,900lbs, compared to 125,500lbs for the -300ERBDSF *(see table, this page)*. The -300ERBCF has a net structural payload of 95,472lbs, which gives a maximum packing density of 6.0lbs per cubic foot.

Preparing for service

The final cost of preparing an aircraft for service comprises several elements of aircraft acquisition and purchase, conversion to freighter, installation of a freight-handling system, maintenance, and upgrades and modifications.

Maintenance will be done in parallel with freighter conversion, and aircraft will have a base check performed. This check may be used to bridge the aircraft onto a new maintenance programme, but will certainly give the aircraft at least 15-18 months of operation until a major airframe check is required again.

Other large maintenance that may be included will be an engine shop visit for one or both powerplants, plus some maintenance on some of the aircraft's heavy components.

A300-600 & A310

The A300-600 and A310 have an airframe maintenance programme of a series of eight checks with an interval between each of 15 months. The total base check cycle thus has an interval of 120 months. The fourth and eighth checks, the C4 and C8, are the heaviest and include structural inspections. Performing one of these during conversion would mean the aircraft would need the least amount of airframe maintenance after going into operation. A C4 or C8 check could only be justified,

Besides FedEX, there has been little demand from independent freight operators for the A310. The majority of those converted are by passenger airlines using the aircraft for their own freight services.

however, if the aircraft's airframe check was a C2 or C6 check. If the previous check had been a C8, C1, C4 or C5 check then only a lighter base check would be required. This would be a C1, C2, C5 or C6 check, which could be heavier than normal if the aircraft had to be bridged to a new maintenance programme.

The check that is required will be reflected in the aircraft's purchase value. Operators are also likely to acquire the aircraft and operate them until they reach a C4 or C8 check, the cost of which would prohibit continued economic operation.

A C1, C2, C5 or C6 check consumes a total of 3,500-4,000 man-hours (MH) plus $75,000-85,000 for materials and consumables. Using a standard labour rate of $60 per MH, this takes the total cost to $285,000-325,000.

A heavier C4 or C8 check consumes 25,000-30,000MH and $1.0-1.2 million in materials and consumables, taking the total to $2.5-3.0 million.

Stripping and painting will use about 2,000MH and $50,000 in materials, taking the total cost to about $170,000.

The aircraft will also require maintenance of some of their heavy components. The landing gear overhaul interval is 8-10 years, so most aircraft are unlikely to require this maintenance. The time remaining until the next landing gear overhaul will be reflected in its purchase value. If it does have to be overhauled then a typical exchange fee of $600,000 is likely to be incurred.

A shop visit for a thrust reverser costs $350,000. Intervals between visits are about 6,000 flight cycles (FC), however, so one is unlikely to be required.

The A300-600 and A310 are equipped with the GTCP 331-250 auxiliary power unit (APU). This has a shop visit interval of about 3,000 APU hours, so a light shop visit may be required. A full shop visit costs $250,000, while a lighter visit may cost $150,000.

All eight mainwheel brake units will have to be overhauled at an average cost of $45,000 per unit, incurring a total of $360,000.

A new set of tyres will cost about $10,000, and an inspection of every wheel will cost another $100,000.

In the worst case scenario where an aircraft requires an overhaul or shop visit for every heavy component, the total cost will be $2 million. Where no maintenance is required on the landing gear and thrust reversers, and only a light shop visit needed on the APU, then a total of $550,000 will be necessary for heavy component maintenance.

Another $250,000-300,000 should be allowed for the testing and repair of some rotable and avionic components.

The A300-600R and A310-300 have two main engine types: the PW4000-94 and CF6-80C2. In the case of the PW4000-94, the A310-300 is powered by the PW4152 or PW4156, while the A300-600R is powered by the PW4158. The PW4152 and PW4156 have a shipset of life limited parts (LLPs) with uniform lives of 15,000 engine flight cycle (EFC). A new shipset has a list price of $3.8 million.

A higher-rated PW4158 has the same shipset of LLPs, but their higher thrust rating means their lives are limited to 15,000EFC.

Most A300-600Rs and A310-300s have been operating on FC times of 1.0-3.0FH, so their PW4000 engines are likely to require LLP replacement every eight to 18 years. This means most engines are unlikely to require LLP replacement when freighter conversion is performed. The remaining life of engine LLPs in both powerplants will be reflected in the aircraft's purchase value.

Engine shop visit intervals are 4,500-5,000EFH for aircraft that are operated at 1.5FH per FC, and increase to 12,000FH when operated at 3.0EFH. The cost of a hot section inspection or performance restoration is $1.8-2.3 million, while a full overhaul is $2.5-3.0 million. A single engine shop visit is likely for an aircraft undergoing conversion to freighter, or at least an engine shop visit will be required within a few years of conversion.

The CF6-80C2 variants for the A300-600R are the -80C1A3 and -80C2A5, while the A310-300 is equipped with the -80C2A2. These have removal intervals of 5,000-15,000EFH depending on EFC time.

The engines have a set of LLPs with lives of 15,000-20,000EFC for most parts. A full shipset of parts has a list price of $3.9 million.

A core restoration shop visit workscope costs about $2.2 million, and heavier shop visits that include work on other modules cost up to $2.7 million, and an overhaul can cost more than $3.0 million. Again, a single shop visit is likely to be required for an aircraft undergoing conversion to freighter.

An aircraft in reasonable condition will therefore need $1.3-1.5 million for airframe and component maintenance, while one needing a heavy check and full overhauls or shop visits on their heavy components will have a higher cost of $3.5-5.0 million, which will be reflected in a lower purchase value. An additional $2.2-2.5 million will be required for an engine shop visit during or a within a few years of conversion to freighter. An engine not requiring a shop visit should have a borescope inspection performed and its EGT margin and maintenance condition and records reviewed.

767-200ER/-300ER

The 767 has an airframe maintenance programme of four checks, each with an interval of 6,000FH, 3,000FC and 18 months. The check is performed depending on which interval is reached first. The base check cycle is completed at the fourth check, the C4, after a total

The 767-200 has had moderate success in the freighter conversion market, despite few becoming available and values of most being too high to justify modification. The availability of 767-300ERs is expected to increase after a few years of 787 deliveries. This is likely to bring down 767-300ER values at a time when freight carriers are re-fleeting.

interval of 24,000FH and 72 months.

The C4 check is the heaviest check, but the second C2 check is also relatively heavy compared to the lighter C1 and C3 checks.

Like the A300-600R and A310-300, a heavy check during freighter conversion can only be justified on the 767 if the previous check was a C2 or C3 check. The total labour input for a C1 or C3 check is 4,500MH, 8,000MH for a C2, and 15,000MH for a C4 check. The additional cost of materials and consumables for these checks is $100,000 for the lighter checks, $150,000 for the C2 checks and $300,000-350,000 for the C4 checks. A labour rate of $60 per MH takes the total cost to $360,000 for the C1/3 checks, $630,000 for the C2 checks, and $1.25 million for the C4 check. The aircraft's purchase value will be adjusted according to the actual check required at purchase and conversion.

Heavy component repair and overhaul costs are similar to those of the A300-600R and A310-300. At least $550,000-600,000 will be needed for heavy component maintenance, and up to $2 million may be necessary.

Another $250,000-300,000 should be allowed for testing and repair of some system rotables and avionics.

The 767-200ER and -300ER also use similar versions of the PW4000-94 and CF6-80C2 to the A300-600 and A310-300. The 767-200ER utilises the PW4052 and CF6-80C2B6/B7, while the 767-300ER uses the PW4056/60/62 and CF6-80C1B6/B7. These will have similar shop visit costs and LLP list prices to the engines powering the A300-600R and A310-300. The engines therefore have similar removal intervals, so an engine shop visit is unlikely to be required at time of conversion to freighter, but may be necessary within a few years.

Again, the remaining life of LLPs in both engines and their maintenance condition on the purchased 767 will be used to adjust the purchase value.

Aircraft in a reasonable condition will therefore need $1.3-1.9 million for airframe and component maintenance. An aircraft requiring a heavy check and more extensive component maintenance would incur a higher cost of $3.5 million, with a commensurate reduction in its purchase value. An additional $2.2-2.5 million will be required during conversion, or a few years after, for a single engine shop visit. Actual engine maintenance condition and status is used to adjust aircraft purchase value.

Preparing for service

The total costs of aircraft acquisition, maintenance and preparation for service have to be considered against the lease rentals the aircraft are likely to realise in the market.

The A300-600R is likely to lease for $250,000-275,000 per month, and the smaller A310-300 for $225,000-240,000 per month. Lease rentals need to have a lease rate factor of 1.3-1.5% per month. This puts a cap of $21 million on the total cost of preparing an A300-600RF for service, and $17.5 million for an A310-300F.

The 767-300ER is likely to lease for about $300,000 per month in a normal market, while the 767-200ER can be expected to lease for about $250,000 per month in the same condition. This limits the investment of preparing the 767-200ER and 767-200ER for service as freighters at $23 million and $18.5 million.

With the costs of the freighter conversion and maintenance described, market values of A300-600Rs need to be in the $7-8 million range. The lowest values can only be expected from late 1980s and early 1990s vintage aircraft, but vendors are currently asking $12-18 million for aircraft that are on the market. Availability is likely to increase as described, however, and values could fall to the level required over the next few years.

The A310-300's lower lease rentals and smaller capital expenditure mean that conversion to freighter could only be justified at acquisition costs of up to $6 million. Most A310-300s are converted by passenger airlines that then use them for their own freight operations.

The 767-200ER is in a similar position to the A310-300. A large number of 767-200ERs have been retired from primary operators, and values have fallen. Late 1980s aircraft are available for less than $10 million, but the type is less popular than the A300-600RF and 767-300ERF because of its size. Acquisition of 767-200ERs for conversion to freighter can only be justified at values of $5-7 million. Values of late 1980s-built aircraft are estimated at $8-9 million, although it is hard to get actual values because of the absence of transactions. The $13-15 million investment for freighter conversion and preparation maintenance cannot be justified by most lessors when few freight operators are acquiring new fleets. The economics are likely to be different in a few years after the freight market has recovered and more aircraft are available.

The situation is similar for the 767-300ER. Current lease rentals of $300,000, however, are likely to increase to $350,000 following a recovery in the freight market. This would allow a higher level of capital expenditure. The availability of 767-300ERs is also tight, mainly due to delays of 787 deliveries. A current lease rate of $300,000 means that feedstock used passenger aircraft need to be available at a cost of $7-8 million. Only low gross weight aircraft are available at $15-20 million. Like the 767-200ER, the situation will become better for converting 767-300ERs after a few years when more have become available and demand for freighter aircraft has improved. AC