While the 757-200 has remained popular with passenger operators, it is reaching a crossroads. It is still a workhorse for some first-tier carriers, while secondary users have been able to take advantage of its economic performance. The aircraft is also proving popular as a freighter.

The used market potential of 757-200s

The 757-200 has always been in a class of its own. The 200-seater has the best seat-mile economics in the narrowbody class. This is one of the main reasons why a large portion of the fleet has remained with its original operators. The type also makes an attractive freighter. Many of the 757-200's large US operators now face the constant erosion of their domestic market share by low-cost carriers (LCCs), which makes the aircraft too big on many routes. The older 757-200s have now reached an age and value where they are right for conversion to freighter, yet demand for passenger-configured aircraft is still strong. The aircraft has therefore reached a crossroads, and owners and operators need to consider the investment and market potential of used 757-200s.

Fleet profile

There are 951 757-200s in passenger or freighter configuration that are either active, parked, or awaiting or undergoing conversion to freighter. Of these, 815 are passenger-configured aircraft, and 136 are freighters *(see table, page 9)*. There are also 66 parked 757-200s, although these include aircraft waiting for or undergoing conversion to freighter.

The 757 fleet is sub-divided in several ways. The most usual is between the two main engine types: the Pratt & Whitney (PW) PW2037/40 and Rolls-Royce RB211-535C/E4. The RB211 dominates the fleet, and accounts for 548 aircraft. The PW2000 powers the other 403 *(see table, page 9)*.

The active passenger fleet can also be sub-divided between those aircraft that have the winglet modification supplied by Aviation Partners Boeing, and those that do not. This modification is significant because it reduces fuel burn, especially in the cruise and at higher altitudes, by up to 4.7% on longer sectors, although it is only 2% on shorter sectors of 500nm. The modification adds two feet of wingspan and 1,400lbs to the aircraft's operating empty weight (OEW), as well as structure in the end of the wings to support and attach the blended winglet.

A disadvantage of the winglets is that none of the three passenger-to-freighter conversion programmes is certified for aircraft with this modification. Aircraft being converted to freighter need to be unmodified, or have the winglets removed.

Of the 749 active passenger aircraft, 185 have winglets, and 564 do not. This group is split almost equally between PW- and RR-powered aircraft *(see table, page 9)*. Of the 66 parked aircraft, only three have winglets.

The fleet can also be sub-divided by production line number. Precision Conversions' modification accounts for 21 of 57 converted aircraft. This modification is certified to allow aircraft above line number 210 a maximum zero fuel weight (MZFW) of up to 196,000lbs, and a gross structural payload of 80,000lbs *(see table, page 11)*. This compares with payloads of 67,000-72,000lbs for aircraft below line number 210. Aircraft with a line number up to 210, built from 1992 to 1989, can only have an MZFW of 184,000lbs.

Of the 564 active aircraft without winglets, 99 are below line number 210, and the other 465 are above it *(see table, page 9)*. These are split about equally between PW- and RR-powered aircraft, and fall into three main groups.

The first group is PW2037-powered aircraft, of which there are 149. The main fleets include Delta Airlines (72), Northwest (7), Shanghai Airlines (10), United Airlines (45) and Uzbekistan Airways (50).

The 63 oldest aircraft, which are those built up to 1991, have the lowest values. This makes them the most likely conversion candidates. Another 24 aircraft were built from 1992 to 1995.

The second group comprises 69 PW2040-powered aircraft. United has the largest fleet, with 45. Seven aircraft were built up to 1991, and 56 from 1992 to 1995.

The third group comprises the 247 RB211-535E4-powered aircraft. The main fleets are operated by Air China (13), American Airlines (64), British Airways (11), China Southern (20), First Choice Airways (7), Skyservice Airlines (11), Thomas Cook (13), Thomsonfly (14), USAirways (11), and Xiamen Airlines (8). Up to 1991 69 aircraft were built, and another 89 from 1992 to 1995.

This means that there are almost 140 aircraft in service that were built up to 1991, which are above line number 210 and do not have winglets.

These three groups are clearly the best candidates for conversion, although the other 99 aircraft without winglets and below line number 210 have lower market values and make good candidates for express package operations.

The fleet of 66 inactive aircraft also includes some suitable freighter conversion candidates. There are 35 aircraft without winglets that are below line number 210, and another 28 without winglets that are above line number 210. Some of these are waiting for or undergoing conversion for operation by FedEx, while others are ex-ATA and Northwest Airlines aircraft.

Aircraft availability

The 757-200's uniqueness means it remains popular with European leisure operators like Monarch, Thomsonfly, Thomas Cook and First Choice Airways. The aircraft is also still popular with its Chinese operators.

The number of parked aircraft has increased over the past year with the

failure of ATA and Far Eastern Air Transport of Taiwan.

Another possible source of aircraft in future months is those operated by US majors. Northwest, which merged with Delta in late 2008, has 11 mid-1980s-built PW2037-powered aircraft parked. "These are the oldest in Northwest's fleet, however, and the PW2037 engines on the aircraft do not have the reduced temperature configuration (RTC) modification," says Dave Thompson, president at Aurora Aviation.

Fleet consolidation by the two carriers may see further reductions in their 757-200 fleets, but many US majors still rely on it. "Delta and Northwest modified and upgraded their younger 757-200s for long-range operations," adds Thompson. "There is also no alternative to the 757-200 for American, United and others. The aircraft is United's workhorse, and most of the fleet is more than 20 years old, possibly making the aircraft too old for conversion to freighter. United is doing sale and leasebacks with them, but does not currently have a surplus of 757s.

"Other 757s are coming off-lease, but many RB211-powered aircraft are still too expensive for conversion to freighter, so they will continue as passenger aircraft for a while," says Thompson. "Aircraft should be converted to freighter when they are 20 years old, so that they have another 15 years of operational life left. This means that aircraft built from 1988 to 1992 are the best freighter conversion targets now. The 757 is still in demand for passenger operations, so aircraft are more likely to be retired gradually, rather than in large numbers. Another factor preventing a larger number of aircraft coming available is that lessors' book values are still higher than market values, and they do not want to sell aircraft at a loss. The aircraft is still being taken up by Russian airlines and European charter carriers for the secondary passenger market."

Values & lease rates

FedEx has chosen the 757 to replace some of its 727Fs. "This has kept values high, since FedEx is ready, willing and able to acquire aircraft," says Thompson.

Aircraft built from the mid-1990s onwards have the highest maximum take-off weights (MTOWs) and are equipped for extended range twin-engine operations (Etops). These have the highest values.

Current market values of 757-200s built up to the early 1990s, in a half-life maintenance condition, are currently $0.8-1.6 million lower than base values, according to Avitas. This puts values of 1982-1987-built aircraft at $6.5-9.4 million, but these may be considered too old for conversion to freighter. They may be suitable for express package operations with low rates of utilisation. Moreover, their early production may mean they have low payload capacities compared to younger aircraft, which is not an issue for express packages.

"Aircraft built from 1988 to 1992 are most likely to be considered for conversion," says Thompson. "The oldest of these, 1988 and '89, have values of $8.5-10.0 million; the 1990-1992-built aircraft have values of $11-12 million."

Values of younger aircraft vary from $14 million for 1994-built examples and up to $33 million for the youngest ones built in 2004 and 2005.

These younger types are clearly likely to remain with their current operators. The values and lease rates obtainable for the older models will influence whether they are released to passenger carriers, or if conversion to freighter is considered.

"It is a challenge to find aircraft with the right combination of airframe age of 18-22 years and remaining engine life. Engines with 3,000 engine flight cycles

757-200 FLEET SUMMARY

Aircraft description	PW-2037/2040 powered	RB211-535 powered	Total
Active aircraft without winglets			
Active passenger aircraft pre-L/N 210	66	33	99
Active passenger aircraft L/N 210 & above	149 +69	247	465
Active aircraft with winglets			
Active passenger aircraft pre-L/N 210		1	1
Active passenger aircraft L/N 210 & above	43 + 11	130	184
Parked passenger aircraft without winglets			
Aircraft pre-L/N 210	11	24	35
Aircraft L/N 210 & above	11	17	28
Parked passenger aircraft with winglets			
Aircraft L/N 210 & above	2	1	3
Total passenger-configured aircraft	**362**	**453**	**815**
Active freighter aircraft			
Active PCF aircraft pre-L/N 210	2	5	7
Active PCF aircraft L/N 210 & above	2	8	10
Active ASF aircraft pre-L/N 210		1	1
Active SF aircraft pre-L/N 210	1	31	32
Active SF aircraft L/N 210 & above		5	5
Active PF aircraft	36	42	78
Parked freighter aircraft			
PCF aircraft pre-L/N 210		2	2
PF aircraft		1	1
Total freighter-configured fleet	**41**	**95**	**136**
Total fleet	**403**	**548**	**951**

Source: ACAS fleet database

USED PASSENGER-CONFIGURED 757 LEASE FINANCIALS

Aircraft description	757-200 1986 5-yr lease	757-200 1991 5-yr lease	757-200 1991 7-yr lease
Current value-$	8,000,000	12,000,000	12,0000
Refurbishment-$	250,000	1,500,000	1,500,000
Total investment-$	8,250,000	13,500,000	13,500,000
Annual depreciation-$	1,200,000	1,440,000	1,440,000
Book value @ end-$	2,000,000	4,800,000	1,920,000
Estimated market value-$ @ end	2,000,000	6,000,000	4,500,000
Equity-%	20	20	20
Debt-$	6,600,000	10,800,000	10,800,000
Debt balloon-$	0	2,400,000	600,000
Monthly debt repayment-$	126,000	160,500	146,600
Monthly overhead-$	20,000	20,000	20,000
Total monthly outflow-$	146,000	180,500	166,600
Monthly lease rental-$	150,000	198,000	198,000
Monthly cashflow-$	4,000	17,500	31,400
Cashflow over term-$	240,000	1,050,000	2,637,600
Resale less debt balloon & equity-$	350,000	900,000	1,200,000
Total cashflow-$	590,000	1,950,000	3,837,600
Profit from lease rentals-$ less depreciation, interest & overheads	835,000	2,253,000	3,240,000

(EFC) to the next shop visit are the best candidates," says Thompson. "Conversion to freighter must be considered against a probable lease rate of $225,000 for an aircraft ready for service. The alternative is to re-lease the aircraft as a passenger model with a lease rental of $185,000-210,000 per month for aircraft of the same vintage."

These rentals represent a lease rate factor of 1.8% per month. Older aircraft would attract monthly lease rates of $120,000-175,000 on the same basis. This would be high enough to amortise their acquisition cost, and the aircraft are likely to be too old for many to consider converting them to freighter. The 757 fleet is still active, and parting out some older types will be an economic option.

Secondary passenger market

Marketing and leasing the aircraft in a passenger role can be economic and profitable, depending on how the capital cost of acquiring the used aircraft and refurbishing its interior compares with the lease rentals it is likely to attract. The aircraft's residual value after a lease of five to seven years is also an issue .

Avitas currently values a 1986-built example at $8.5-8.8 million, and expects this to fall to $6.9 million in 2013, and $5.9 million in 2015. Values of a 1991-built aircraft, currently at $11.5-12.0 million, are forecast to fall to $10.3 and $9.0 million in five and seven years. This predicts annual depreciation rates of 4.5-5.0%, but these could be accelerated by a sudden increase in availability.

The 737-300's value profile has already been affected by the aircraft being displaced and overshadowed by the new technology of the 737-700 and A319. Values of the 737-300 have dropped, especially in 2000-2002 after 9/11 and an increased number of A319s and 737-700s were delivered, causing a large number of 737-300s to come onto the used market.

The 757 has yet to be displaced by new types and retired in large numbers. This is more likely to happen over the next five to seven years so lessors and investors have to consider investing in 757-200s carefully. Once a larger number of 737-800s, A320s and 787s have been delivered, 757-200s will start to be retired in larger numbers than so far seen. There is also the risk that a US major will fail, which could see a large number of aircraft coming on to the used market and so bring down values at a faster rate than previously seen. This drop in values would also push down lease rates.

A 1986-built aircraft may therefore have a market value of $2 million or less after a five- or seven-year lease when the aircraft is 28-30 years old. The aircraft may therefore only have a scrap or part-out value mainly related to its engines.

Since the aircraft is likely to have only a part-out value, its annual depreciation would have to be at least 15%, down to 0-25%. A likely lease rental is in the region of $150,000 per month.

A 1991-built aircraft may have a market value of $6.0 million after five years, and $4.5 million after seven, and would be 22-24 years old at the end of the term. This aircraft could depreciate at a slower annual rate of 12%, down to 40% after five years, and 26% after seven. An aircraft of this vintage can currently achieve a lease rental of $195,000-200,000 per month.

How fast lease rentals can depreciate the asset, or cover the debt repayments and lessor's overheads over the next five or seven years, raises the issue of debt terms the lessor is able to secure. These are: the cost of debt; the debt: equity ratio; and availability of a debt balloon.

Lessors are unlikely to get debt terms with a debt balloon for older aircraft. The debt needed would be the acquisition cost of the aircraft plus the refurbishment cost, less the equity invested by the lessor. Debt providers will offer relatively low debt percentages for older aircraft that will only have scrap or part-out value at the end of the term. The lessor will prefer to have a debt portion of 80% to one of 60%. A 1986-built aircraft would have $6.6 million or $5.0 million of debt to repay at these two debt portions, but the lower debt portion means that $3.3 million of equity has to be invested in the aircraft. This is $1.3 million more than the possible re-sale value of $2.0 million. The higher debt portion of $6.6 million will leave a surplus between market value and equity at the end of the lease. Financing the aircraft with a debt portion of 80% results in an overall cashflow of $1.39 million *(see table, this page)*.

The 1991-built aircraft is more likely to secure a debt balloon as part of its financing terms: 20% for a five-year term and 5% for a seven-year term. Assuming $1.5 million is invested in refurbishing the aircraft, and that an 80% debt portion is provided, $8.4 million and $10.2 million of debt will have to be repaid over five and seven years.

On this basis the lease rentals provide a positive cashflow over debt repayments and overheads, while the market value also leaves a positive cashflow over debt balloon and equity *(see table, this page)*.

There is also the book profit of the transaction: the lease rentals less the costs of book depreciation, interest and lessor's overheads. There is also the book profit of actual market value less book value.

The 1986-built aircraft can generate a positive cashflow from lease rentals less debt repayments, and profit after book depreciation and interest, but it has an inherent risk of suffering a large fall in its market value.

PAYLOAD SPECIFICATIONS OF PRECISION CONVERSIONS' 757-200 PASSENGER-TO-FREIGHTER MODIFICATION

Aircraft type	757-200PCF RR/PW Pre-L/N210	757-200PCF RR/PW L/N 210+	757-200PCF RR/PW L/N 210+	757-200PCF RR/PW* L/N 210+
MZFW lbs	184,000	184,000	188,000/186,000	196,000/194,000*
OEW lbs	116,500/116,150	116,000/115,650	116,000/115,650	116,000/115,650*
Gross structural payload lbs	67,500/67,850	68,000/68,350	72,000/70,350	80,000/78,350*
Maindeck ULD containers:				
ULD containers:	15 X 88/125	15 X 88/125	15 X 88/125	15 X 88/125
ULD volume-cu ft:	6,600	6,600	6,600	6,600
Lowerdeck bulk volume-cu ft	1,790	1,790	1,790	1,790
Total volume-cu ft	8,390	8,390	8,390	8,390
ULD tare weight-lbs	7,140	7,140	7,140	7,140
Net structural payload-lbs	60,360/60,710	60,860/61,210	64,860/63,210	72,860/73,210*
Maximum packing density lbs/cu ft	7.19/7.24	7.25/7.30	7.73/7.53	8.68/8.73*
Volumetric payload @ 7lbs/cu ft	58,730	58,730	58,730	58,730
Flat maindeck pallets:				
Pallet tare weight-lbs	3,600	3,600	3,600	3,600
Net structural payload-lbs	63,900/64,250	64,400/64,750	68,400/66,750	76,400/74,750

**** Subject to certification of MZFW upgrade to target of 194,000lbs FOR PW-powered aircraft of line number 210 & higher.***

The 1991-built aircraft generates both a positive cashflow from lease rentals, and a book profit from book depreciation and re-sale value.

757 passenger economics

The economics of continued passenger operation should also be considered from an airline's viewpoint. This is subjective, since the 757-200 has no direct narrowbody competitor that can carry out many of its missions. The highest gross weight A321-200 is the narrowbody with seat numbers and operating performance closest to the 757-200. The A321-200 is up to 10 seats smaller and does not have the 757's range. The 767-200/-200ER and A310-300 can also operate the same missions as the 757-200. The widebodies are clearly heavier and have higher operating costs, so the 757-200 remains a popular aircraft in a class of its own.

Compared to a new A3210-200, a used 757-200 has higher cash operating costs, and its lower lease rentals and higher seat capacity make it cheaper to operate and give it a lower cost per seat. In a two-class configuration the 757-200 has 190 seats, and the A321 has 180.

On a typical 1,000nm and 150-160 minute mission, the 757-200 burns 2,800 US Gallons (USG) of fuel, equal to $3,900 at current fuel prices. The A321-200 by comparison burns 2,200USG.

The 757-200's main weakness is its maintenance costs. The largest element is its engines. RB211-535E4 engines have high shop visit costs of $3.0-3.5 million, but long shop visit intervals of 17,000-19,000 engine flight hours (EFH). The PW2000 has cheaper shop visits, but shorter removal intervals. The costs per EFH of the two engines are therefore similar.

The 757-200's overall maintenance costs are $1,400-1,500 per FH, while the A321-200's are $1,100-1,200 per FH.

Including the cost of employing flight attendants and flightcrew and other smaller direct operating costs, the 757-200's total trip cost is $11,000, compared to $9,000 for the A321-200. A 1991-built 757-200, however, has a market lease rate of $195,000 per month, while for a new A321-200 with a purchase discount this will be $390,000. Overall, the two aircraft have close total costs per trip. The 757-200's higher seat count gives a cost per seat of $70, compared to $75 for the A321-200. The 757 is clearly still competitive, and its longer range capability makes it more flexible.

Conversion to freighter

The target age for freighter conversion candidates is about 20 years. As Thompson explains, lessors can expect monthly lease rates of $225,000 for a converted aircraft ready for service. For the transaction to be viable this amount needs to be equal to 1.5% of the total investment of acquiring, converting and preparing the aircraft for service.

There are three main passenger-to-freighter conversion programmes for the 757-200. The first is Boeing's, which provides an aircraft with 14-and-a-half maindeck container/pallet positions. This has already been used to modify aircraft for DHL, and has been chosen by FedEx, which is having its aircraft converted at ST Aerospace. This conversion provides an MZFW of 184,000lbs for aircraft up to line number 210, and a higher MZFW for aircraft of line number 210 and higher. RB211-powered aircraft can have an MZFW of 188,000lbs, and PW2000-powered aircraft can have an MZFW of 186,000lbs. The OEW of 119,500lbs leaves a gross structural payload of 64,500lbs, 66,500lbs or 68,500lbs.

Precision Conversions offers the second conversion programme, which is the only one to provide 15 full maindeck

The optimum age for freighter conversion is about 20 years. Market values of 1988- to 1990-built aircraft are in the $8-10 million region; the appropriate level for freighter modification.

container/pallet positions. This gives the aircraft 6,600 cubic feet of maindeck cargo volume, in addition to another 1,790 cubic feet of underfloor space. This takes the total volume to 8,390 cubic feet.

Precision has converted 20 of the 21 remaining 757-200s. There are four main weight specification variants of the Precision Conversions modification.

The first of these is for older aircraft up to line number 210, which were built from 1982 to 1989. These have an MZFW of 184,000lbs and an OEW of 116,150-116,500lbs, depending on engine type, and so a gross structural payload of 67,500-67,850lbs *(see table, page 11)*. This is reduced to a net structural payload of 60,360-60,710lbs if ULD maindeck containers with tare weight of 7,140lbs are used. Most general freight carriers use netted pallets. These have a lower tare weight of 3,600lbs for 15. Net structural payload is thus 63,900-64,250lbs *(see table, page 11)*.

Precision Conversions may offer an increased MZFW of 188,000lbs for these aircraft, which would add another 4,000lbs of gross and net payload. The supplemental type certificate (STC) for this may be offered by mid-2009.

The second weight specification is for later-built aircraft higher than line number 210. These have a basic MZFW of 184,000lbs and a slightly lower OEW than older aircraft, but close gross and net structural payloads.

The third specification is for a higher MZFW version of the same line numbers, with 188,000lbs for RR-equipped models and 186,000lbs for PW2000-equipped aircraft. This increases payloads by 2,000lbs or 4,000lbs depending on engine type.

The fourth specification is for a higher MZFW for aircraft above line number 210, available only for aircraft converted by Precision Conversions. This raises MZFW to 196,000lbs for RR-equipped aircraft, is already available, and raises gross payload to 80,000lbs. It also takes MZFW to 194,000lbs and gross payload to 78,350lbs for PW-equipped examples. The STC for this should be available by mid-2009.

Alcoa-SIE offers the third freighter modification, a fourteen-and-a-half maindeck pallet/container modification. So far only one aircraft, line number 180, has been converted with this programme. This is in service with Varig Log.

Winglets are also an issue. These are present on some aircraft following a modification offered by Aviation Partners Boeing. Winglets have been installed to reduce wingtip vortex drag and fuel burn (by 2% on shorter sectors), but they add 1,400lbs to the aircraft's OEW. They are therefore less desirable for freight operators, many of which have relatively low rates of aircraft utilisation. Also, FedEx has asked for the paperwork to de-modify passenger aircraft with winglets that it is converting. Removing winglets is expensive, and none of the passenger-to-freighter modification programme STCs have the approval to install cargo doors on aircraft equipped with winglets. This means that aircraft without winglets will be preferred for freighter modification over those equipped with winglets. Precision Conversions, however, is analysing the effect of winglets, and may provide an STC that allows winglet-equipped aircraft to be converted to freighter in the next seven to 12 months.

There is a total of 564 passenger-configured aircraft without winglets, comprising 99 aircraft below line number 210, and 465 line at line number 210 and higher *(see table, page 11)*.

The list price for Precision Conversions' modification is $4.65 million. The pivotal issue is the additional cost of maintenance. Lower C checks cost $300,000-350,000, and a similar amount should be allocated for component repairs. A conservative budget for additional maintenance required during conversion would be $1.0 million for an aircraft in a half-life condition. This condition reflects the current market values described.

The expected lease rentals of $225,000 per month effectively cap the total investment for a lessor at $15 million. This would include aircraft acquisition, conversion to freighter, additional maintenance, and interest incurred between aircraft purchase and entering service with a lessee. The cost of conversion and maintenance at $1.0 million puts the acquisition cost of the aircraft at up to $9.5 million - the market values of half-life 1988 and 1989 aircraft.

Aircraft requiring a heavy C4 check or engine shop visit would incur higher maintenance costs, and so should have proportionately lower acquisition costs. A C4 check can cost in the region of $1.3 million. Engine shop visits are even higher, with a workscope for a PW2037/2040 costing up to $2.8 million. Shop visits for the RB211-535E4 are higher still at up to $3.5 million. "The RB211's shop visit costs are too high for many prospective freighter operators," says Thompson. "The PW2000-powered aircraft are the preferred freighter conversion candidates."

Half-life 1988- and '89-built aircraft are therefore in the zone of convertibility as far as age, market value and specification are concerned. Although not many aircraft are currently available, this problem is balanced by the fact that few freight carriers are actively acquiring new aircraft, and debt financing for used aircraft is now harder to secure than it was in the past. A higher rate of 757 freighter conversions is likely once the economic downturn has bottomed out, and more used aircraft are available. AC