

The age of 727s about to be retired by the US majors means lessors and investors may only be able to make a business case for freighter conversion with younger and higher-powered aircraft. The older examples will have to find other markets where weaker lease rates for passenger aircraft can support their lower capital costs.

Late 727 retirement calls for prudent acquisition decisions

Major US airlines have been expected to retire their 727s on at least two occasions. Previous retirements had been put off by recession and aided by the fact that the 727 was still acceptable to the US majors. Now *en masse* retirement really is going to happen. So how will this fact influence the merits of investing in the 727?

Lessors investing in aircraft will have to weigh the cost of acquiring and making 727s serviceable against prospective lease rates and residual values. Many 727s will be required by the freight sector, but the size of this demand will be a key factor in investors' willingness to buy.

"It has become a buyers market," says Ron Anderson, president of Intrepid Aviation. "The fact that a lot of hushkitted aircraft will come on to the market will force down values. The issue now is that the youngest aircraft have accumulated about 50,000 flight hours (FH) and these are the only ones likely to be bought. Competition has also brought down hushkit prices. It is now also possible to get kits from scrapped aircraft. This all means that investors will have to be a lot more cautious about making investments than they have had to be in the past."

727 fleet status

There are currently 1,251 active 727s with or without hushkits, 51 re-engined with the Rolls-Royce Tay and a further 32 with the BF Goodrich re-engine modification.

About two-thirds of the aircraft are currently in the US and the majority have commitments made for Stage 3 modification. Only about 55 do not have any commitment made to Stage 3 modification.

Very few aircraft remain in Europe. The largest fleets consist of hushkitted aircraft that are operated by freight carriers. Only one batch of aircraft, the 25 operated by Iberia, has no modification commitment and will soon be retired.

The majority of aircraft coming on to the market over the next five to six years will be Stage 3 compliant.

FedEx now has the largest fleet and will likely need more. Delta has the second largest fleet of 131 aircraft. It has made firm commitments for 104 aircraft to be hushkitted with the Feasi system. Despite Delta's order with Feasi, there is speculation that 23 may be fitted with the Raisbeck system before the end of 1999.

Delta recently announced that it had agreed to sell 120 of its aircraft to Pratt & Whitney (P&W). It is likely that the first 20 retired in 1999 will not be hushkitted and may be scrapped for spare parts.

Most of Delta's aircraft are good-quality machines ranging in age from 18 to 27 years and with -15/-15A engines. P&W is working with Republic Financial Corp and will convert the aircraft and remarket them as freighters. The remaining 11 of Delta's fleet are also likely to be scrapped. The scrapping of about 30 aircraft will mean virtually all of Delta's fleet that come on the market will be hushkitted.

P&W's acquisition was probably made at a competitive price and so can be offered at attractive lease rates. This deal results in less good-quality aircraft, pushing up prices, and an increase in the number of good quality freighters, pushing down lease rates. This could make it harder for lessors with weaker bargaining power who are trying to acquire and then lease other -15 and -17-powered aircraft. P&W's 100 aircraft will be converted, possibly with Hamilton Aviation's modification, and are due for retirement between 2000 and 2005.

American has 76 -7 and -9-powered aircraft all of which will be hushkitted: 22 with Feasi systems and 52 with lightweight Raisbeck hushkits.

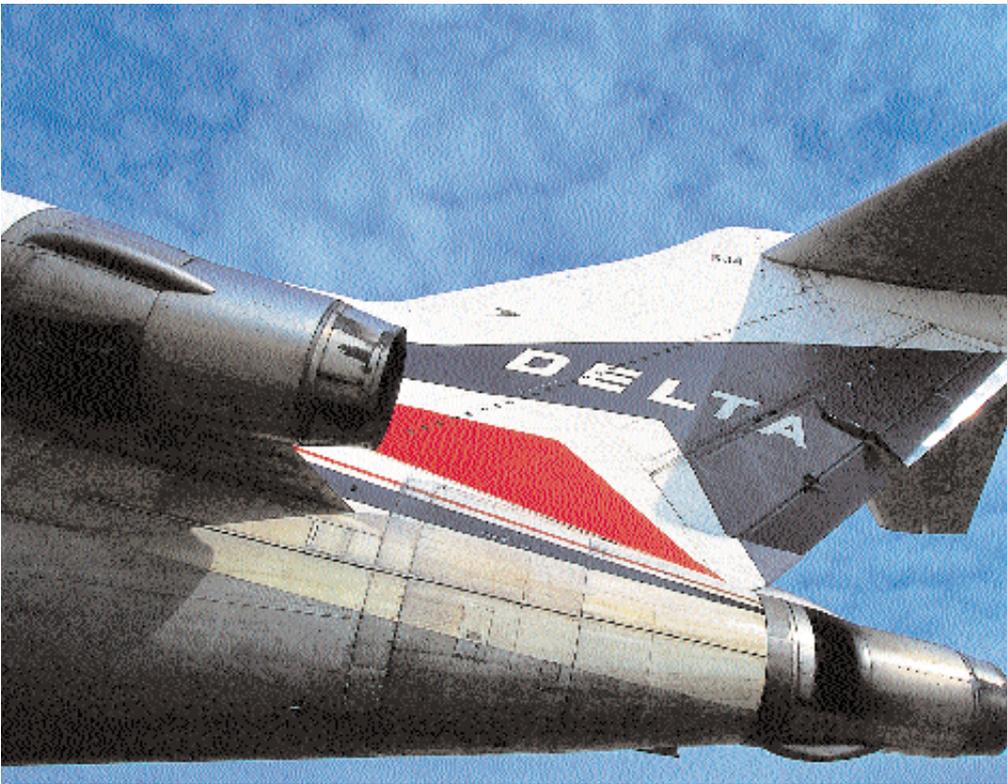
United has 75 good-quality high-gross weight aircraft. These are hushkitted with Feasi systems and will continue to operate up until 2007. They will, nevertheless, be entering the market at the same time as some of Delta's fleet.

Northwest now has only 37 aircraft left, 34 of which are hushkitted. The other three will be returned to lessors and will probably be hushkitted for new lessor Championair.

Continental has 23 aircraft, none of which are hushkitted, all of which will be returned to lessors before the end of 1999. Finova has bought some and will probably hushkit and convert them to freighters. Major 727 lessor Pegasus already owns some and may buy others.

Continental Micronesia has 13 aircraft, four with hushkits but with no commitments made to hushkit the other nine.

TWA has 26 aircraft and is selling 15 of its high-gross weight aircraft, with low



accumulated FHs and cycles, to Pegasus which has 15 orders for the BF Goodrich re-engining programme. The 11 other TWA aircraft are low-gross weight models that may be scrapped. This will reduce even further the number of un-modified aircraft coming on to the market, maybe even to zero.

US Airways probably has the last fleet in the US that will be dispersed on to the market over the next few years. It has only 11 aircraft left, four of which are hushkitted. The remainder will be returned to lessors.

Besides firm orders for hushkits, there are about another 70 options held for kits. These are held mainly by freight carriers that have plans to acquire more aircraft. Options are also held by lessors that have plans to buy more aircraft.

727 markets

Because of the overwhelming ratio of modified to un-modified aircraft in the fleet, any that are not now modified will either be fitted with low-cost hushkits or their owners will attempt to market them outside the US.

This macro view of the 727 fleet means that at least 360 hushkitted 727-200s, either configured as passenger aircraft or as freighters, could be put onto the market by the US majors and lessors in the next five to seven years. A third of these will be ex-Delta aircraft.

The best prospects for the 727 are in conversion to freighters to satisfy demand for capacity in the US. Other prospects exist in Central and South America, which will show a preference

for older and un-modified aircraft because of low market values.

Europe is now viewed as a closed market because of its proposed rules to prevent further hushkitted aircraft operating in EU airspace. Confidence that this proposed law could actually be dropped has increased in recent months. European freight operators are rumoured to be getting ready to acquire more 727s should the ruling be dropped.

The one problem that repeated delays in the 727's retirement has caused is that now even the youngest aircraft are about 20 years old. This means that only the youngest aircraft with the highest gross weights and highest-powered engines will be in demand and may be the only option that would make sense to would-be investors. Since lease rentals are required to fund equity and debt in the aircraft, airlines may now find it harder to sell their older -7 and -9-powered aircraft.

There have been various forecasts as to how many 727 freighters will be required by the US industry over the next five years. Some estimate it to be between 200 and 300. "It is probably closer to 200 than 300," says Anderson.

If predictions of a need for 200 727 freighters are correct then up to 160 aircraft due on the market will become surplus. These are likely to be older -7/-9-powered aircraft with the lowest market values. Some could be absorbed by small, niche passengers operators in the US. An excess of aircraft would put pressure on values. This would be partially alleviated by a higher than forecast demand in the US and an open market in Europe.

Pratt & Whitney's acquisition of 120 of Delta's -15-powered hushkitted 1972-1981-built 727-200s will make it more competitive to buy other younger -15 and -17-powered aircraft. It will also put downward pressure on lease rates of younger 727 freighters at a time when other better quality aircraft will be coming on to the market. Investment decisions will have to be made more prudently.

Another issue creating demand away from the US is the BF Goodrich Super 27 re-engining programme. This programme increases installed thrust and so improves field and payload-range performance. The programme has become more popular in the past year and is winning orders in Central and South America.

Because of enhanced performance the Super 27 is rarely take-off weight restricted, unlike unmodified or hushkitted 727s. In fact, the Super 27 is able to operate direct routes in Latin America that are not possible with much larger and longer range types. The Super 27 therefore provides a more economical option than new aircraft and so could generate new levels of demand for 727s in Latin America.

Where performance is not such a key issue, older -7 and -9-powered aircraft could also find their way to Latin America, Africa or Eastern Europe.

Acquisition issues

The supply and demand for 727s is just one issue of which would-be buyers have to be wary. The 727 has had some ageing aircraft issues that have complicated the prospect of acquiring them and this has increased over the past year.

The problem is that the 727 is now aged and as a result more structural issues are beginning to affect the aircraft. To start with, the 727 had a raft of ageing aircraft structural modifications that had to be dealt with as well as the corrosion prevention and control programme (CPCP).

The 727's first package of ageing aircraft modifications are due at 20 years



and will have been completed for most aircraft. The second package, due at 60,000 accumulated flight cycles (FC), is regarded as being uneconomic to complete, since most aircraft would have reached an age of about 45 years.

The CPCP and supplemental structural inspection document (SSID) will both be incorporated into the aircraft's heavier C checks and will raise the number of man-hours (MH) required for on-going maintenance.

"The CPCP has precedence over the original structural inspections (SIs) in the maintenance planning document," explains John Nichol, planning superintendent at ATC Lasham. "This means the CPCP increases the frequency of SIs. Some operators forget to incorporate the CPCP with the SIs and unnecessarily have to repeat the same inspections."

"There are more and more stringent inspections coming along for the 727,"

says Nichol. "An airworthiness directive (AD) was issued in February 1999 with respect to two forms of inspections on the skin lap joints. These can be inspected visually or with an eddy current. The threshold inspection is at 40,000FC. Repeat external inspections are required every 600FC but the internal inspection has to be done every 3,000FC and so every two or three C checks. Because more and more ADs and SBs are coming out all the time the number of MH required for C and D checks is steadily growing."

There are several new structural issues that have raised more doubts about the 727's economic viability in the past year. "There is AD 98-11-03, which relates to all structurally significant items (SSIs)," says Clayton Hamilton, executive vice-president of Hamilton Aviation. "If an SSI is affected by some sort of modification then AD 98-11-03 requires a supplemental structural

Values and market conditions are two factors of which 727 investors have to be wary. There are also an increasing number of ADs and ageing aircraft issues that buyers and operators should be well-versed in if they are to avoid unpleasant surprises following purchase.

inspection programme (SSIP) to be developed to monitor the whole of the fleet with that modification. An example of an SSI is a freight door modification. Every freight door modification supplemental type certificate (STC) holder will have to devise an SSIP for their freight door modification.

"AD 98-11-03 also applies to repairs. Because of this AD, additional inspection programmes have to be devised every time the aircraft is repaired in such a way as to affect a SSI. For this reason AD 98-11-03 has become known as the stealth AD.

"We have a finite element model (FEM) which allows an accurate assessment of internal loads. The FEM can develop an SSIP with the longest possible inspection intervals. For example, we have developed a freight-conversion STC and our FEM allows us to create a SSIP with the maximum possible inspection intervals," says Hamilton.

"Depending on the weight required by the operator the freight floor modifications may not be that bad, but they all need a new STC to provide a fix. The cost of hushkitting an aircraft is more expensive than fixing this problem. We have developed our own freight modification STC and an additional STC to cover the freight floor issue. Our freight floor STC can actually be used for any previously existing freight conversion STC to correct floor loading restrictions. It allows a load of 8,000lbs per pallet position, but can be tailored to give any combination of 6,000lbs and 8,000lbs pallet positions.

"Some freight conversion STCs have developed freight floor fixes with vertical side restraint STCs. These changes could possibly affect SSIs and if so would be subject to AD 98-11-03 and require a SSIP," claims Hamilton. "Our freight conversion comes with a SSIP and a heavy floor permitting pallets of 8,000lbs and costs about \$1.6 million."

Acquisition costs

All possible elements of acquisition cost include the following: aircraft, hushkit or re-engine modification, freight conversion modification and freight floor fix, bridging airframe maintenance or heavy check, engine maintenance, component repair and exchanges and

avionic upgrades. The total of these could be substantial, even for old aircraft with -7 and -9 engines.

The market value of 727-200s is subjective. Because the majority of US major fleets are hushkitted it can be assumed that acquired aircraft will be Stage 3 compliant, operational and in a state of continual maintenance.

Most appraisers take an assumed value for un-modified aircraft and simply add the cost of a hushkit to derive the market value for a Stage 3 capable aircraft. Hushkits have recently come down in price and so values of modified aircraft have been adjusted accordingly. There is now also a difference in the price of a hushkit for the same gross weight variant of an aircraft.

Aircraft that are younger than 15 years without hushkits and in an 'as-is' condition are generally regarded as having a market value of about \$3.5–4.0 million. Some estimates take the value for later 1970s and early 1980s -15 or -17-powered aircraft as high as \$5.0 million.

The cost of lightweight hushkits from Raisbeck is just \$0.7 million. The intermediate gross weight kit has a list price of \$1.1 million and the high gross weight kit a price of \$1.3 million.

The lightweight Feasi hushkit for -200 aircraft up to gross weights of 178,400lbs has a list price of \$1.8 million. Feasi's heavyweight kit has a list price of \$2.625 million and is for aircraft with gross weights up to 204,000lbs.

The youngest aircraft with hushkits could therefore be assumed to have a maximum market value of \$6.3 million. Values for these -15 and -17-powered aircraft are more likely to be \$4.5–5.0 million bearing in mind the large numbers coming on to the market.

Hushkitted aircraft built in the late 1960s and early 1970s with -9 power are more likely to have a market value closer to \$3.0–3.5 million. Their age and a surplus could push values down even lower. Older Stage 3 modified aircraft with high-power -15 engines will be about \$3.5–4.0 million.

Aircraft will require some level of bridging maintenance, which will be at least a C check. Freight conversion may also be required.

A few 727s are parked in the desert, but given the number of operational aircraft now coming available, the parked aircraft are unlikely to be rejuvenated.

"Performing a D check at purchase is rare, unless one is actually due at the time," explains Vern Alexander, director of marketing at Evergreen Air Center. "In addition to checks, ageing aircraft modifications, stripping and painting, component changes and engine work all have to be done".

SUMMARY OF ACQUISITION AND BUILD COSTS FOR 727-200H/727-200FH

Aircraft model	727-200H -7/-9 engines (passenger)	727-200FH -7/-9 engines (freighter)	727-200FH -15/-17 engines (freighter)
	\$	\$	\$
Aircraft acquisition (with hushkits fitted)	3,000,000	3,000,000	5,000,000
Freight conversion		1,300,000	1,300,000
Bridging C check	400,000	400,000	400,000
Component exchanges and repairs	260,000	260,000	260,000
One engine HSI	400,000	400,000	400,000
Two engine overhauls	1,200,000	1,200,000	1,600,000
Total acquisition cost	5,260,000	6,760,000	8,960,000
Net acquisition cost with engines on sale and leaseback	3,160,000	4,660,000	5,760,000

"The C check for a stored aircraft can be between 9,000 and 12,000 MHs if components are changed and service bulletins (SBs) are performed. Paint and strip, which will be required for a new operator, will consume about 1,800MH," says Alexander. "It is a difficult decision whether to perform SBs because they will not necessarily be cost-effective for an old aircraft. An investor may spend a few hundred MH, but is not likely to spend 1,000MH on SB upgrades."

Taking a C check as the required maintenance for an operational aircraft, it is likely to consume about 6,000MH and use about \$100,000 worth of consumables and rotatable repairs. Together with MH, the check would cost about \$400,000.

The difficulty with used aircraft is the maintenance status of components and engines. A portion will, however, be due for removal and repair.

A landing gear exchange is required every eight years and will cost about \$145,000. A heavy shop visit for an auxiliary power unit will cost about \$85,000.

Wheels are all likely to require an inspection, and it would be prudent to put all brakes through a shop visit and remould the complete set of tyres. Performing all these tasks would incur an additional expenditure of \$260,000.

It could be assumed that for aircraft that will continue to operate in the US or in Latin America no expenditure is required for avionics.

Engine costs

The biggest unknown is the area of engine-related costs. Aircraft being retired from airlines will have engines in all stages of maintenance condition, although it is more likely that airlines will run-out engines before retiring aircraft. This would probably mean two engines would require a heavy shop visit.

Investors have to weigh up the differences between putting engines through a shop visit and swapping run-out powerplants either with freshly overhauled ones or with those that have had at least a hot section inspection (HSI).

"It is hard to put values on run-out engines because people buy them for different reasons," explains Dane McBroom, director of engine programmes at American Air carriers Support. "Values of run-out -7s are about \$100,000 and \$150,000 for -9s. The -11 is a bit of an oddball because there are not that many around. The -15 and -17 are worth about \$250,000 in a run-out condition.

"The value of time-continued engines is hard to assess because their maintenance status is affected by a variety of factors. First, there is the AD 60-38 issue relating to compressor corrosion. Then there is the age of the life limited parts (LLPs), the cycles the engine has done since its last HSI and the quality of build at its last overhaul," explains McBroom. "Time continued values are from \$350,000 to \$600,000



for -7s and -9s and from \$500,000 to \$800,000 for -15s and -17s.”

Charlie Little, vice president of engine sale and leasing at The Ages Group puts market values for time-continued -15/-17s a little higher at \$600,000 to \$900,000.

Buyers have various choices. They can either sell run-out engines and buy time-continued ones, they can sell run-out engines and buy freshly overhauled ones or they can put their run-out engines, bought with the aircraft, through a shop visit with a full overhaul.

“The first choice is risky, since there are several issues which could occur immediately after buying a time-continued engine and result in extra expense. The other two choices are less risky and have a similar cost,” says McBroom.

“Freshly overhauled engines can be bought; these are engines which have just had a heavy shop visit to give them a long on-wing time and new LLPs. Freshly overhauled -7s and -9s can be bought for about \$700,000–900,000,

while it can cost up to \$1.5 million for a -15 or -17.

“A value of \$1.5 million for a -15 or -17 might be a little high,” claims Bill Cumberlidge, executive vice president at The Ages Group. “Most engines of this quality will get about \$1.1 million to \$1.2 million at the moment”.

“A heavy shop visit costs about \$300,000 for -7s and -9s and \$500,000 for -15s and -17s,” says McBroom. “A set of LLPs costs about \$400,000 for the -7/-9 and \$450,000 for the -15/-17. Basically, the cost of a run-out engine, a heavy shop visit and set of LLPs is about the same as the value of a freshly overhauled engine. Considering that a freshly overhauled engine provides the least risk and longest on-wing time then this is the best state to achieve for an investor than buying an aircraft with run-out engines.”

“There are three economic ways to manage engines. The first is to arrange a power-by-the-hour (PBH) maintenance contract. The second is to buy the aircraft and then do a sale and leaseback deal on the engines with a company like

The problem many 727 operators now have is that because their aircraft are old, costs of freight conversion and bridging maintenance can be higher than the actual aircraft value. These costs are also similar regardless of age. Lease rates for older aircraft will be low compared to their acquisition costs. Acquisitions will only be feasible for lessors if values come down.

us, and then pay a dry lease rate for the engine and maintenance reserves. We will manage the engine and remove all technical issues for the lessor and lessee. This arrangement also releases a lot of capital the buyer has invested in the aircraft and makes it available for other expenditure, such as hushkitting or freight conversion,” says McBroom.

The amount of capital will vary. Whatever condition the engines are in when they are acquired, expenditure for a full overhaul including a new set of LLPs will have to be made within a few years. The safest bet would be to have run-out engines overhauled and time-continued engines put through a light shop visit or HSI at purchase.

“Selling them afterwards would then reduce the net cost of a hushkitted -15/-17-powered aircraft by up to \$4.0 million,” says McBroom. “The third option is to buy an aircraft without engines and lease them separately and pay a maintenance reserve in addition. This way the buyer completely avoids the acquisition cost of the engines and of having to manage them with respect to maintenance.”

Freight conversion at a minimum cost of \$1.0 million should be added to this, although investors should regard this cost as being potentially higher considering freight floor and SSIP issues. The other extreme is to use Hamilton Aviation’s modification at a cost of \$1.6 million, but then avoiding any future problems.

Total costs

The total costs of acquisition (see table, page 23) assumes that two engines have to be put through a complete overhaul. The table shows that this cost is a substantial part of the total cost for making the aircraft operational.

The table then shows the net cost of the aircraft after securing a sale and leaseback transaction on the engines and having got the value for two freshly overhauled engines with a set of LLPs and one time-continued engine.

The sale and leaseback could therefore reduce the costs of the -7/-9-powered aircraft by about



\$2.1 million and the -15/-17-powered ones by about as \$3.2 million.

This would take the total acquisition costs for the three examples down to \$3.16 million for the -7/-9 passenger aircraft, \$4.66 million for the -7/-9-powered freighter and \$5.76 million for the -15/-17-powered freighter. The high net cost for a -7/-9-powered freighter relative to a -15/-17-powered freighter illustrates the high value of engines for an old aircraft compared to its whole value, as well as the superior economics in buying a high-powered younger aircraft.

Post-purchase considerations

Even after acquisition and the process of making the aircraft serviceable, lessors and lessees will still have to be aware of likely airframe, engine and component maintenance charges.

Annual C checks will have an all-inclusive cost of about \$400,000 and heavy C checks or D checks will have a total cost of about \$1.5 million and will have to be performed every 10 years. These two checks will place an annual financial burden of about \$550,000 on the lessee.

The lessee will also have to pay engine reserves. This would be at least \$1,150,000 amortised over a minimum of 6,000 engine cycles per engine for a light shop visit and overhaul. Reserves for all three powerplants would therefore be as high as \$570 per FC.

The lessor has to consider the acquisition costs compared to likely lease rates. As already described, acquisition costs could be substantially reduced by a sale and leaseback

arrangement on the engines. Either the lessee would pay separate lease rentals for the airframe and engines, or the lessor would lease the engines from a third party and an element of lease rentals from the lessee would service the engine payments.

This technique could now be crucial considering the probable remaining life of the aircraft and the lease rentals that the aircraft can attract. The supply of aircraft will put pressure on lease rates, making it harder to service debt and equity in the aircraft. The debt for the aircraft will have been reduced by the sale proceeds from the engines. The lessor will then use the lease rentals to service the smaller debt for the airframe and lease rentals for the engines. The engine lease could then be arranged so that the term is equal to the aircraft's lease term. This then makes the transaction more digestible for the lessor.

"Although Aviation Lease Finance does not want to get into this vintage of technology, we would consider a deal if it was worth over \$20 million," says Cumberlandidge. "ALF would do the engine sale and leaseback, Ages would provide parts support and Volvo Aero Engine Services the maintenance. We could provide a package with a PBH rate and then be available to sell the lessee's surplus equipment if problems arose."

The remaining life for 727s due for retirement by the US majors could be up to another 15–20 years for the youngest aircraft, assuming that no major legislation subsequently makes their operation impossible. Older aircraft, already 20–30 years old, may only be able to operate for another 5–10 years

Total and net of engines acquisition costs of -7/-9-powered and -15/-17-powered 727s are close. This will polarise the market, making it hard for airlines to sell -7/-9-powered aircraft.

and this may make transactions unviable, even with the possibility for sale and leaseback deals on engines.

Lease factors will be between 1.2% and 1.5% of market value per month. This puts lease rates for high-gross weight hushkitted freighters between \$110,00 and \$140,000 per month. Rentals are as low as \$60,000 per month for older low-gross weight aircraft.

Over a 10-year period at an annual interest charge of 8% the high rental would service \$11.5 million of debt. A lease rate of \$140,000 per month would therefore be sufficient for a lessor to service the typical levels of debt and equity in the case of a -15/-17-powered 727.

A monthly lease rate of \$60,000 at 8% could service \$4.95 million of debt over 10 years. This would make the acquisition of a -7 or -9-powered aircraft converted to a freighter a borderline case. This is another illustration of why the freighter market is likely to avoid the older -7 and -9 powered aircraft. These low lease rates make only -7 and -9-powered 727s suitable as passenger aircraft.

Summary

The costs of making young and old 727s operational as freighters are the same. The costs for freighter modification, C checks and component maintenance form the majority of the investment in these aircraft. This fact, combined with the wide difference in market lease rates for the two aircraft, means that if there is an excess of 727s then only the youngest will be converted. This will leave the older aircraft to the passenger markets and where acquisition costs can be minimised.

Given the age of all 727s and the investment required to make them operational, lessors will look to secure long-term lease contracts. Typical five-year terms could pose too much risk for investors since re-marketing 25–35 year old aircraft in five years will be difficult. The US freight market is strong enough to provide lessors with the right lease terms and rates to make -15 and -17 aircraft a viable investment. This will create high demand for these aircraft and, fortunately for lessors, keep lease rates buoyant.

A lot more uncertainty faces older 727s not yet retired by the majors. Values will have to drop as a consequence.

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