

Previous recessions have been followed by large numbers of parked aircraft flowing back into service. The current downturn has increased the number of parked narrowbodies to 1,200. This time the majority will not operate with first tier airlines again, so what are their market opportunities?

The market prospects for used narrowbodies

A large number of older generation narrowbodies has come onto the market in recent months, including DC-9s, 737-200s, 727s, 737-300/-400s and MD-80s. According to the *AvSoft* fleet database, the number of parked aircraft is close to 1,200. This is likely to increase over the next few years. This raises the issue of what are the secondary markets for these aircraft.

Several markets exist for older aircraft: freight conversion; parting-out for engine and other components; sale as second- or third-use passenger aircraft to airlines in East Europe and the Commonwealth of Independent States (CIS), Africa, Central Asia, Asia Pacific and Central and South America; and as cheap capacity for start-up airlines in Europe and North America. The stability of these markets is as much of an issue.

Aircraft availability

The events of 11th September 2001 accelerated the retirement and parking of large numbers of older narrowbodies. Prior to this large numbers of DC-9s, 727s and 737-200s were already available on the market, and at a steadily increasing rate. The retirement of older narrowbodies had already been accelerated by lower financing charges of new aircraft offered by mega-lessors. Even types like the MD-80 and 737-300/-400 were facing pressure. Many airlines have begun to lease new aircraft, for the first time, from the mega-lessors. Air Mauritania, which has only operated two F.28s for the past 20 years, has recently taken a new 737 from ILFC. These sort of transactions have pushed new aircraft further into the traditional secondary market. This has made it harder to sell used aircraft, increased their availability, and reduced their values.

As a result of 11th September, some airlines' traffic fell by up to 33%, and many aircraft were retired or parked suddenly. The worst affected carriers were the US majors. These airlines reacted by retiring large numbers of owned and fully depreciated DC-9s, 737-200s and 727s, one to three years earlier than planned. These included complete retirements of 737-200 and 727-200 fleets by United and USAirways.

Two major European carriers ceased operations in the immediate aftermath of 11th September: Sabena and Swissair. These operated large numbers of young aircraft, in particular members of the A320 family. Ansett also ceased operations, putting a large number of 737-300s and A320s on the market.

Many other airlines reacted by returning aircraft to lessors before their lease terms had expired.

Three tiers

The 1,200 narrowbody passenger aircraft now available can be broadly divided into three categories: young aircraft that will return to service with first-tier airlines as traffic improves; older generation aircraft with the youngest age and lowest number of accumulated flight cycles (FCs) and which have good secondary market prospects; and the oldest aircraft that are unlikely to have any prospects for continued operation.

There are about 300 units in the first-tier of aircraft. These comprise 20 717s, about 125 737-300/-400/-500s, about 40 737NG aircraft, 33 757-200s and 73 A320 family types (see table, page 10).

Only this tier is likely to go back into first-tier passenger carrier service. Some of the other 757s, which have been returned to lessors, may be converted to freighter. Some of the ex-British Airways 757s will be converted to freighter.

Some of the 737-300/-400s may also be converted to freighter. Most of the 79-300s available are older than 13 years and have more than 35,000FCs. The 26-400s are 10-12 years old.

The second tier comprises about 190 younger 737-200s and about 90 MD-80/-90s (see table, page 10). This also includes a handful of the youngest DC-9s, which are ex-US Airways and some ex-Iberia aircraft that are about 22 years old.

Nearly 300 737-200s are parked, but 120 of these are older variants powered by the JT8D-7/-9 engines and are 20-29 years old (see table, page 10). Many come from small fleets of 1-4 aircraft retired or returned to lessors.

There are 190 younger 737-200s with -15/-17 engines that are 18-23 years old (see table, page 10). A large number have been retired or parked from large fleets from major airlines and so have uniform specifications. These are more desirable for potential secondary passenger operations than the 120 older 737-200s.

The third tier holds a total of about 630 units of the oldest and least desirable aircraft, including the previously mentioned 120 older 737-200s, more than 330 727-100/-200s and about 175 DC-9s (see table, page 10). The exceptions to this are the small number of younger DC-9s.

Market values

The glut of aircraft, their age and probable maintenance status has reduced their market values to an all-time low, and to a point from which many are unlikely to recover.

Mort Beyer, president of aircraft appraisal company MBA says DC-9s with run-out maintenance condition of the airframe, engines and components may have a value of \$200,000. An aircraft with a zero-timed D check or engines will

SUMMARY OF PARKED NARROWBODIES IN PASSENGER CONFIGURATION

| Aircraft | Number | Age (Years) | FCs | Engine type |
|-----------|--------|-------------|---------------|--------------------------|
| 757-200 | 33 | 6-20 | 2,000-60,000 | PW2037/ RB211-535C/E4 |
| A319 | 19 | 0-3 | 0-6,000 | CFM56-5B |
| A320 | 40 | 0-15 | 0-40,000 | CFM56-5A/B |
| A321 | 14 | 1-7 | 5,000-17,000 | CFM56-5B/V.2533 |
| 737NG | 40 | 0-3 | 0-8,000 | CFM56-7B |
| 737-300 | 93 | 4-15 | 9,000-45,000 | CFM56-3B1/B2/C1 |
| 737-400 | 26 | 7-12 | 25,000-31,000 | CFM56-3B2/C1 |
| 737-500 | 18 | 5-11 | 13,000-28,000 | CFM56-3B1/C1 |
| 717 | 20 | 0-2 | 0-4,400 | BR715 |
| 737-200 | 190 | 18-33 | 40,000-62,000 | JT8D-15/-17 |
| DC-9 | 20 | 20-23 | 42,000-48,000 | JT8D-9/-17 |
| MD-81/2/3 | 80 | 12-22 | 30,000-56,000 | JT8D-217/-219 |
| MD-90 | 10 | 2-6 | 2,000-12,000 | V.2525/28 |
| 727-100 | 33 | 31-38 | 31,000-68,000 | JT8D-7/-9 |
| 727-200 | 105 | 23-33 | 45,000-70,000 | JT8D-7/-9 |
| 727-200 | 197 | 20-29 | 55,000-80,000 | JT8D-15/-17 |
| 737-200 | 120 | 23-33 | 53,000-75,000 | JT8D-7/-9 |
| DC-9 | 155 | 25-36 | 55,000-80,000 | JT8D-7/-9/11/-15/-17 |

only have its value increased by the cost of the maintenance.

These values are theoretical, however. The large number of other younger narrowbodies and depressed traffic means few DC-9s will be bought. The only possibility of a secondary passenger role for the DC-9 will be the sale of the youngest units. This will leave parting-out as the only option for most of the other aircraft. Only a small percentage of these units will be required for this, however, because of the glut of material already on the market.

Since it will therefore not even be economic to buy most DC-9s for parting-out, these aircraft could have a zero value. The DC-9, however, does have the JT8D engines. Time-continued units can be used whole or parts taken from them to build engines as an economic alternative to putting engines through a shop visit. Parked DC-9s will therefore have some intrinsic value.

Beyer puts values of run-out 737-200s and 727s at a similar level to DC-9s. "Heavy airworthiness directives (ADs) on the 727 and 737-200 mean the aircraft are not worth buying for continued passenger operation, so the value of the aircraft is down to the salvage value of the components that can still be used on the aircraft," says Beyer. "A lot of this comes down to the engines. The core value of JT8D-7/-9s, that is for the basic engine with little time remaining and stub LLPs, is only \$25,000-50,000. Engines

with zero time since overhaul might be worth \$0.5 million."

Values of 737-200s vary in value, since only younger aircraft with higher powered JT8D variants are likely to be used in passenger service again. The youngest aircraft with -15/-17 engines, hushkitted, with a recent from a D check and good engines will have the highest value, possibly about \$2 million. Older aircraft that are good part-out candidates may have a value of \$0.5-0.7 million. Good condition 727s, which could continue in passenger operation, have a theoretical value of \$600,000-750,000. These values for 727-200s are also theoretical. There are also probably another 200 727s unofficially available, since many airlines are in the process of retiring them. An even larger supply of aircraft will bring their value to zero in the next few years.

Beyer estimates values of the oldest MD-80s, similar to those parked, have a value in the region of \$2 million, while the oldest 737-300s may have values in the \$3-4 million range.

Secondary markets

Although up to 900 aircraft will need to find a secondary market, analysis of their age and accumulated FCs will reveal the difference between the better candidates and those that are unlikely to be used in another operational role.

As previously described, about 120 of

the 300 737-200s parked are old and have the lowest rated engines. There are also 175 DC-9s, but these are all old and many have come from a mixture of operators. Secondary passenger operators have such a large choice of aircraft at low values that they are unlikely to select most of the DC-9s, which are the oldest of all parked narrowbodies.

The group of older 120 737-200s has the same problems as most DC-9s. These 737-200s come from mixed fleets, are the oldest and have the least desirable variants of the JT8D, making them undesirable candidates for continued passenger operation. "Aircraft that are bought for secondary passenger operation usually require a heavy investment in maintenance," explains Doug Jaffe, president at Jetran International. "This is because they have to be brought to the same specification, which means a large amount of interior work is required. It is very expensive to get aircraft from different sources to a standard specification. This high cost will be a deterrent to get older aircraft back into service."

There is also unlikely to be any demand for the 330 passenger-configured 727s in a secondary passenger role. All aircraft are at least 21 years old and have accumulated more than 55,000FCs. The 727's second package of ageing aircraft modifications comes due at 60,000FCs, and the expense of this will be a deterrent to continued operation.

"The fleets of 737-200s and 727-200s from airlines such as United were very high time aircraft and were ready for retirement," says Jaffe. "The same applies to most other 727s and some 737-200s. The 727 has been made beyond economic repair by the MD-80's low values and the virtual death of the 727 freight conversion market."

The large number of 727s and their age, specification and ageing aircraft requirements has reduced their values to less than \$1 million.

This also applies to most DC-9s and older 737-200s. This value represents what could be extracted from higher value parts in the engines. The 727 will also be prevented from further passenger operation by the large numbers of similar-sized MD-80s and 737-400s, with values less than \$4 million.

This therefore reduces to about 300 the number of parked narrowbodies likely to find a secondary passenger role. These are the 190 younger 737-200s, 90 MD-80/-90s and about 20 DC-9s.

These are likely to be joined over the next few years by more 737-200s and MD-80s that will be retired. Values will decrease as competition to find a secondary market increases. The MD-80 has the advantage of being concentrated in a small number of large fleets.

There are about 300 young parked narrowbodies which will probably go back into service with first tier airlines. These include 737-300/-400s, 717s, A320/21s and 757s. Some of these have reached a value where they are suitable for freight conversion.

Freight conversion market

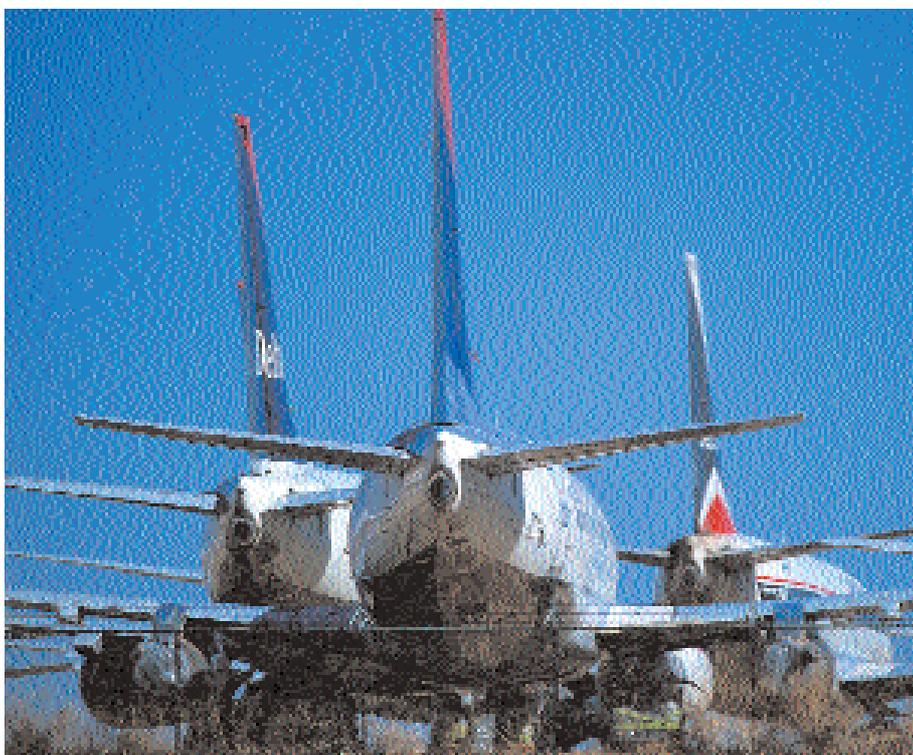
Estimates vary on the future of the narrowbody freighter fleet over the next 20 years because of disagreements of the development of large 727 fleets. A fleet of 727s can be replaced by either the 737-400 or 757, or a mixed fleet of both. Two 727s can also be replaced by a widebody. The actual development of the narrowbody fleet will depend on the fleet plans of a small number of airlines operating large fleets of 727s.

Boeing's market forecast is for the current fleet of small class narrowbody jet freighters, which includes aircraft up to the 727-200, to increase from about 670 units to 930 over 20 years. Almost all the current fleet will retire, resulting in a net increase of about 860 units. This provides a large potential for conversion of types like the 737-300/-400, but also the A320 family and 737-200. Not all of these 860 will be conversions, since a minority will be accounted for by factory built aircraft.

The 727-200 is still an economic freighter, but has several heavy ADs and rising maintenance costs. Major 727 operators are now unlikely to increase their fleets, and the values of several replacement candidates are at a level which makes them competitive.

While the market for conversion of up to 860 smaller narrowbodies may appear large, it may be smaller than predicted. It will be contested by a large number of candidates: 737-200; 737-300; 737-400; A320; and A321. Aircraft that will retire from primary passenger service over the next 20 years will exceed 860. Other secondary markets will therefore need to be found for the 737-300 and -400. There are 1,600 737-300s and -400s in operation. Even if the 737-300/-400 took the whole of the small narrowbody freighter market over the next 20 years, there would still be a large number of aircraft requiring an alternative market. The A320/21 are also likely to penetrate the freight conversion market, and take some market share from the 737.

The 737-300/-400's advantage is that its market values have currently shrunk to the \$3-4 million level; a little higher than lower powered and older MD-80s. This low value reduces the total build cost of a converted freighter, making the 737-300F/-400F more competitive than before. The low value of 737-200s also makes them more viable as freight



conversion candidates. The 737-200F could fill the role of a DC-9F replacement, as well as opening new freight routes with low traffic volumes and replacing many turboprops. This development may bring an unexpected increase in the growth of small jet freighters.

While most the 737-300/-400s that are parked will probably go back into first tier airline service in the short term, the number that will come out of first tier airline service will start to accelerate. Many of these will be the first large number of candidates for freight conversion. Bedek Aviation and Pemco have conversion modifications and other agencies, including AEI, have modifications in the pipeline. The younger 737-200s are also candidates for freight conversion.

Secondary passenger roles

The major secondary passenger markets available to the 737-200, MD-80/-90 and an increasing number of 737-300/-400s are East Europe, the CIS, Africa, Central Asia, parts of the Asia Pacific, and Central and South America. These markets, however, have always been viewed as being targets for used passenger aircraft during recessions and periods of excessive aircraft availability. The number of aircraft in these regions is small, however, and airlines are increasingly taking new aircraft from lessors. This makes it even more difficult to market used aircraft in these regions.

"The events of 11th September 2001 created a unique opportunity for the used aircraft market," says Jaffe. "The aircraft that were suddenly retired and parked

were retired five years earlier than planned. The usual practice for major airlines, especially US majors, is to run-out all maintenance time left on airframe checks, components and engines. This then leaves aircraft requiring a lot of maintenance to get them operational.

"Values of used aircraft were pushed down by the mega-lessors. This left the secondary market generally weak," continues Jaffe. "The sudden parking of large fleets after 11th September 2001 provided large numbers of aircraft from a single fleet with a high time of maintenance remaining. At the same time the glut of aircraft has reduced their values. For example, the value of 737-200s has reduced from \$6-7 million to \$2-3 million. This has provided potential users of used aircraft with a rare opportunity to acquire large numbers of high quality aircraft with a common specification at attractive rates."

Jetran has concluded the purchase of 97 aircraft from US Airways (55 737-200s, 26 DC-9s and 16 MD-80s). Jetran's purchase includes about a quarter of the 300 high quality 737-200s and MD-80s currently available that are likely to be remarketed in a passenger role, putting Jetran in a strong position.

Jetran's sale of 18 ex-US Airways -15-powered 737-200s to Mexican low-cost carrier Aviaca is an example of how high quality aircraft have provided a unique opportunity to airlines. Argentinian carrier LAPA is another potential 737-200 customer. The airline has returned new 737-700s off-lease following a fall in traffic and weakening of its local currency, and is looking for eight 737-200s at low capital cost as replacements.

"The large number of aircraft we



have, and others that are available, makes it attractive to re-deploy used fleets," says Jaffe. "In addition to the aircraft we purchased from US Airways, we also bought spare engines, spare parts and engine overhaul shops. This means we can support the aircraft we either sell or lease out. We are now working on multiple-aircraft orders in the Philippines, Indonesia, New Zealand and Thailand. The current situation provides carriers in these regions their first chance to acquire Stage 3 equipment at low cost. This is now more important since Asian countries are becoming more strict on Stage 3 noise rules."

Jetran also expects to be able to market the -9A-powered DC-9s it has bought from USAirways, since these are the youngest in the global fleet, being built at the end of the 1970s and beginning of 1980s. Jetran also bought 25 JT8D-15-powered DC-9s of a similar age from Iberia, and Jaffe is also confident it can market these. "The age of these aircraft means it is still possible to sell them for passenger operations," claims Jaffe. "There are many DC-9 operators with old fleets that could replace their old aircraft with younger units. The DC-9 does more or less what a 717 can, but for a tenth of the price."

East Europe is an interesting case, since the European Union has dropped its proposed rule to prevent the number of Stage 2 aircraft hushkitted to meet Stage 3 requirements from increasing. Types like the DC-9 and 737-200 could then be acquired by East European and Russian aircraft and operated into West Europe. Russia may also join the World Trade Organisation, meaning heavy Russian import taxes on western equipment will be relaxed or scrapped altogether. Jaffe

also makes the point that Russian traffic is now growing again, after continual years of decline, and the rate of growth is faster than expected.

Rejuvenation costs

Used aircraft transactions are also complicated by the need to re-register aircraft. This often requires maintenance and modifications to be done. The process is also made easier by keeping accurate and up-to-date maintenance records. "For these reasons it is easier to buy aircraft that are Federal Aviation Administration (FAA) registered or ex-FAA registered," says Jaffe. "This reduces the requirement for bridging maintenance and modifications, since most countries accept FAA standards and aircraft can be easily re-registered in other countries."

Operation with US carriers resulted in soft or extended times for many maintenance items. Buyers of used aircraft will probably have to operate used aircraft with the same maintenance intervals as the original maintenance planning document, so they will have to go through extensive bridging maintenance at purchase. Also, maintenance inspectors often require the traceability of parts back to birth. This may mean replacement of many LLPs and other parts due to lack of records, again increasing the cost of bridging maintenance. These costs, as well as bringing the aircraft to a standard specification, can be a deterrent to purchase, particularly in the case of low lease rates from mega-lessors.

Many buyers of used passenger aircraft will be lessors. Purchase prices and cost of bridging maintenance will have to be considered in relation to

Of the 900 older generation narrowbodies, there are 300 younger aircraft which are the best candidates for secondary passenger use. These have the lowest accumulated flight cycles, the highest rated engines and come from large fleets and so have uniform specification.

market lease rates. Lease rate factors of used passenger aircraft are generally in the region of 2% per month of purchase price in a stable market. Lease rates of good quality 737-200s are in the region of \$50,000 per month, while rates for older MD-80s are reported to be \$50,000-90,000. These are half the rates available before 11th September 2001.

These lease rates represent lease rate factors in excess of 2% on market value, but the additional costs of bridging maintenance have to be borne by the buyer and subsequent lessor. "Although lease rates of used aircraft have dropped since 11th September 2001, the values of aircraft have fallen further. This makes the ratio of lease rate to purchase price better than it was before the downturn," says Jaffe. "Also, lease rates may rise again, further improving the ratio."

The large number of older 737-200s, DC-9s and 727s will make it cheaper to support the better aircraft that continue as passenger or freighter aircraft. "The glut of JT8D engines means very few are being put into the shop for maintenance. Most operators are buying time-continued engines on the used market for less than the cost of a shop visit," says Jaffe. "This can probably continue for two or three years, meaning these operators can avoid the typical engine maintenance reserves of \$75-100 per engine flight hour for this period. This generates a large saving in cashflow."

Despite their low costs and attractive economics, the 737-200 and DC-9 have to be considered against the MD-80 and 737-300/-400. Not only have the MD-80's values have now fallen to the \$2 million level, but the aircraft also has the McDonnell Douglas durability, is Stage 3 compliant and has a 145-seat capacity. "Some MD-80s have been marketed in Latin America in recent years, and we have recently packaged a deal for a lessor," says Eldad Ben-Yosef, president of Aeron Aviation. "Although the 727 has some unique characteristics, the MD-80 is a very attractive aircraft where there's a market for it. The MD-80 is also a good DC-9 and 737-200 replacement. One example is Aerorepublica in Colombia which recently acquired two MD-80s and plans to take more. The MD-80's Stage 3 compliance is important as more Latin American countries require aircraft to be Stage 3 compliant."



About half the parked narrowbodies comprise the oldest aircraft, including more than 300 passenger configured 727s. The large supply of younger aircraft and the age of the oldest aircraft means the majority of parked 727s, DC-9s and older 737-200s will not see any further operation, either in a passenger or freighter configuration.

Parting-out

A small percentage of the aircraft that are unlikely to operate again as passenger aircraft or be converted to freighter will be broken down for parts salvage.

Most of the value in the 737-200, 727 and DC-9 lies in the engines. The large number of these types that have already been broken for parts means parts supply is high and values low. Also, the buyer has to consider the cost of parting-out, overhead, marketing cost and repair charge for each component when considering the purchase price. The values quoted for parting-out aircraft are therefore theoretical, since their value is zero if there is no interest in buying them.

"I estimate the value of a 737-200 airframe and its components is only \$100,000-150,000 to an established parts trader with a broad customer base," says Nick Finazzo, chief executive officer at AeroTurbine. "Values of the DC-9 and 727 are half that. However, the MD-81s/82s will have higher values, because few have been parted out."

Once parted-out, buyers will have to repair components to get traceable repair tags and warranties for the components to make them marketable. All these costs need to be recovered and a margin made, while at the same time the supply of parts on the market will increase due to a large number of aircraft being broken up.

The Baby JT8D engines account for most of the value in the older narrowbodies. Values of JT8Ds have fallen due to the high number of parked aircraft (about 800), with 1,900 installed engines. Core engines have values as low

as \$25,000, while -15/-17 engines with the highest maintenance status have values as high as \$350,000-400,000. Nick Finazzo explains that a -15/-17 engine freshly built from the shop with 8,000-10,000FC remaining will have the highest values of \$550,000-600,000. This is lower than the cost to provide the overhaul to get it to this condition. A heavy shop visit can cost in the region of \$850,000-900,000, since a full set of LLPs has a list price in the region of \$600,000.

The low cost of time-continued engines means it is more economic for airlines to acquire used engines or modules on the aftermarket, than put their own run-out engines through a shop visit. This situation could last for another two or three years, because supply of used and time-continued engines is so high.

Finazzo explains the dividing line between purchasing time-continued engines and putting them through a shop visit. "It is only economic to put an engine through a shop visit if the workscope is light. If the workscope required to get an engine to a standard where it will have a reasonable number of FCs on-wing is high, it will be more economic to scrap it for parts salvage and buy another time-continued engine for operation," says Finazzo. "Workscope required is one factor, while calendar limited time on-wing is another. This is partially affected by ASB6038. ASB6038 basically limits time between compressor inspections, which force a shop visit, to seven years for engines operated on a low utilisation schedule. Parked engines will

become classified as low utilisation, and so subject to ASB6038. All the time they are parked they are losing available time on-wing. Therefore maintenance status, and so value, depends on time remaining to next ASB6038 inspection and condition of engine hardware. A light workscope, that makes a shop visit economic, is one where only an ASB6038 inspection is required. A larger workscope is too expensive and the engine is better as a trade-in parts candidate."

Finazzo explains that JT8Ds can broadly be categorised in three groups. The first group is engines which only require a minor workscope and are economic to put through a shop visit.

The second category is engines in a good maintenance status, with 3,000 FCs or more of on-wing time remaining which allows them to continue in operation. "These are flyer engines. Freight carriers do about 1,000FCs per year, so engines with 3,000FCs left are good candidates. Flyer engines would need at least 3,000FCs and three years to the next ASB6038 inspection left. The lower powered variants of -7B/-9A in this category probably have a market value of \$250,000-300,000, while -15/-17s have a value in the region of \$350,000-400,000."

Engines with less than a year of on-wing time left and requiring a hot section inspection or other heavy repairs are not flyer candidates, but part-out engines. "These fall into the third category, since the cost of a shop visit is economically prohibitive," says Finazzo. "Engines get parted-out for the extraction of LLPs, rather than turbomachinery parts. Turbine blade scrap rates tend to be high, although first stage turbine blades can be sold if they have accumulated a low time on-wing and are in good condition. As a general rule, the part-out value of an engine is therefore limited to the value of its LLPs, and anything that can be saved should be considered a bonus. If the disks have less than 4,000FC remaining, the engine will be almost worthless. The value of engines with longer life LLPs are basically pro-rated according to their remaining lives, with an adjustment made for the cost of teardown, selling and overhead. This puts values of part-out engines generally below the \$100,000 level." 