

There are more than 1,000 Stage 2 aircraft without a commitment to Stage 3 modification. Around the world there is uncertainty about Europe, new markets are slowly opening up in Latin America and South Africa and a large number of hushkitted aircraft have become due for retirement. The remaining hushkit market varies from a few aircraft to several hundred.

# How large is the remaining hushkit market?

Assessing how many more aircraft will be made Stage 3 compliant has been clouded by the EC's proposed regulation to cap hushkitted aircraft in its airspace. There is also the possibility that the European and neighbouring market will disappear altogether (*see Confusion over European hushkit ruling, page 4, Aircraft Commerce, November/December 1998*). However, this could be balanced by the fact that other markets are opening up in several countries in Latin America and in South Africa. So just how many more aircraft are likely to be modified?

## Market complexity

The first step in answering this multi-billion dollar question is to analyse the

fleet breakdown of each relevant type. These include the 707, 727, 737-100/-200, DC-8, DC-9 and BAC 1-11. Stage 3 modifications are available for all these except the last.

Each fleet is spread globally and varies in age and condition. Some aircraft are modified, some have firm orders outstanding and options are also held to modify further aircraft. The remainders are all potential candidates.

The maximum size of the remaining market includes the conversion of options plus aircraft that have no modification commitment. More than 120 options for hushkits are held for several aircraft types. There are more than 1,300 aircraft without a commitment to modification.

The number of aircraft requiring compliance that remain in North America and Europe will determine the rest of the market in the short-term. However, the issue is not that simple, since aircraft flying into North America and the EC from outside will also have to be modified.

The market is also split between short-haul and long-haul markets. That is, there is a greater requirement for DC-8s and 707s located in all regions of the world to be hushkitted since they nearly all fly into North American and European airspace. This adds to the short-term market.

An estimate of numbers is made even more difficult by the uncertain fate of aircraft in North America and Europe due to come off lease, and the difficulty



Unlike the 727, demand in the secondary market for 737-200s is weak. This will mean there is less demand to keep aircraft in North America and Europe.

of estimating the number due to be retired or scrapped.

Aircraft taken off lease will have to be remarketed. Without modification commitments in place such aircraft are likely to be remarketed into areas that do not require compliance. However, sales into Latin America may eventually require aircraft to be modified, a factor that will boost the hushkit market in the long-term.

## Compliance deadlines

Stage 3 compliance deadlines put varying degrees of limitation on the number of aircraft that can still be modified.

The simple December 1999 deadline in north America does not automatically limit the number of aircraft that will be modified. A large number of options to hushkit are held for aircraft in the US and Canada.

The current rates of production mean that not all options can be converted before the 1999 deadline. However, aircraft that miss the deadline could still be parked or leased temporarily outside north America.

The EC's compliance deadline of 2002 has been overridden by its proposed capping policy (*see Confusion over European hushkit ruling, page 4, Aircraft Commerce, November/December 1998*). This policy does not require an increase in the number of hushkitted aircraft operating in EC airspace after 1 April 1999. This means it is now too late for any new commitments to hushkit, including conversion of options.

If the rule is passed, any aircraft without a modification commitment will have to be sold to another area. Unmodified aircraft registered outside the EC will be prevented from operating into EC airspace.

The EC's rule is not law, however, and may still be dropped due to mounting pressure from a large number of companies. If the rule is not passed the European market and a portion of the long-haul market will be restored.

## 727 fleet

Recent data shows there are 1,341 active 727s (*see table, this page*), including parked aircraft. This is the remaining fleet of the 1,831 that were originally built.

The fleet breakdown clearly shows how these aircraft are operated geographically and how they are split between those that are modified, those with options for modification, and those with no commitment to hushkitting or re-engining.

Firm orders for all 727 Stage 3

## SUMMARY OF 727 GLOBAL FLEET

727-100/-200	Globe	North America	Latin America	Europe	Africa/Mid East	Asia/Pacific
<b>Firm orders for</b>						
<b>Stage 3 modifications</b>						
FedEx	707	661	9	30	4	3
Raisbeck	72	70	1		1	
Duganair	31	31				
Tay re-engining	52	52				
Super 27	33	26	5		2	
<b>Total</b>	<b>895</b>	<b>840</b>	<b>15</b>	<b>30</b>	<b>7</b>	<b>3</b>
<b>Options for Stage 3 modifications</b>						
FedEx	52	44	8			
Raisbeck						
Duganair	3	3				
Tay re-engining						
Super 27	5	2	3			
<b>Total</b>	<b>60</b>	<b>49</b>	<b>11</b>			
<b>Aircraft not committed for modification</b>						
	386	35	138	82	109	22
<b>Total</b>	<b>1,341</b>	<b>924</b>	<b>164</b>	<b>112</b>	<b>116</b>	<b>25</b>

modifications stand at 895, the majority being accounted for by the FedEx hushkit. The majority of these orders are with aircraft operating in north America. This clearly illustrates that continent's commitment to maintaining the 727 in the service.

The fleets operating in north America are unlikely to increase in size. Virtually all big 727 fleets in the US are now hushkitted, are due to be hushkitted or hold options for hushkits. American, Delta, United and Northwest have made commitments to modify the whole of their fleets and have no options outstanding.

North America holds 49 options, 44 of which are for the FedEx hushkit, four for the Duganair system and two for the Super 27 programme. All options for the FedEx kit are held by small package operators. Other options are held, but hushkit suppliers often view them with caution. Operators sometimes place options to secure their fleets if they keep them.

There are another 35 aircraft in north America without Stage 3 modification. Most of these aircraft are parked and the majority are owned by leasing companies, having been returned by lessees.

Small package operators are

constantly seeking to acquire good quality hushkitted 727s. The main source for these will be aircraft retired from the major operators. The rate of acquisition will depend on how many are being retired from the large airlines. There will be a steady number, but it will not always be fast enough to satisfy the demand of package operators.

Freight operators may be prepared to consider acquiring and hushkitting parked aircraft or any others that come available on the market.

Not surprisingly there are few modified 727s outside of north America. More than 160 727s are held in Latin America. Only 15 have been modified. This includes two aircraft that have been re-engined with the BF Goodrich Super 27 modification. This improves the aircraft's take-off performance and is advantageous over a hushkit when operating from hot and high airfields in the region. The small number modified makes sure that the right percentage of aircraft operating into north America are compliant.

Eleven options are held for hushkits and re-engining programmes for aircraft in Latin America. These are likely to be implemented as the deadline to have a 100% Stage 3 compliant fleet in north America is reached.

The only aircraft with commitments to Stage 3 modification belong to Mexicana. The airline has eight firm orders for the FedEx system and another eight options.

All other carriers have a total of 138 aircraft between them that are unmodified. This includes ACES Colombia, Aero Continente, Aero Peru, Allegro Airlines, Ecuatoriana, Lloyd Aero Boliviano, Teasa, and some of Mexicana's fleet. About 40% of these 727s are owned by US lessors with lengthy remaining lease terms.

Europe did have a large base of 727s, but fleets have been replaced and many have gone to the US. Those that remain are freight aircraft. There are no options for Stage 3 modifications for 727s in Europe.

There are still 82 727s in Europe without a Stage 3 modification commitment. This includes Iberia's fleet and aircraft operated by airlines such as JAT and THY. Many could supply the US small package carriers if supply of retired hushkitted aircraft gets tight. Others may remain in Europe and be hushkitted if the EC's ruling is overturned or dropped, or they could be sold to Latin America. The quality of remaining European aircraft is generally high and all 82 aircraft are strong hushkit candidates.

Only seven aircraft in Africa and the Middle East are Stage 3 modified. This includes two that are re-engined with the Super 27 programme. As in Latin America, this choice is because of the hot and high conditions of the area.

There are no options for modifications in this region. There are also 109 aircraft without commitment to hushkitting in Africa and the Middle East. Some will remain in the region and are generally older and poorer quality aircraft. Others are due to be retired. This includes aircraft operated by Qatar Airways, Kuwait, Tunis Air and Air Algerie. Like the European aircraft, they could meet demand from US small package airlines if supply becomes tight.

There are only three modified aircraft in the Asia Pacific region. The remaining 22 will be modification candidates when they are sold.

## 727 market

The 11 options for Latin American aircraft will probably be converted. The fate of the 138 with no commitment depends on noise reduction requirements in the countries where these aircraft operate. The remaining size of this market could therefore be substantial, but may take several years to develop.

This will also be offset by Latin American airlines now ordering aircraft, such as the A320.

The 44 aircraft parked in north America could also be candidates. Although the majority were built during the late 1960s and early 1970s, they will be the first in line to supply small package carriers if the number of hushkitted aircraft retired by the majors gets short. All 49 options will probably be converted.

The 82 non-committed aircraft in Europe are still strong candidates, as are the better half of the 110 aircraft in the Middle East and Africa and some of the 22 in Asia. Of the 456 aircraft with options and no commitments to modification about 380 are still good candidates.

This includes, however, the 138 in latin America that are not yet under any obligation to be hushkitted. Some will have to be hushkitted if they are to continue flying into the US.

The remaining hushkit market is therefore split between short-term business for operations into the EC and north American airspace and the not so clear long-term business in regional latin America. The most influential factor concerning the size of the market will be the demand for aircraft by small package carriers in the US.

## SUMMARY OF GLOBAL 737-100/-200 AND DC-9 FLEETS

737-100/-200	Globe	North America	Latin America	Europe	Africa/Mid East	Asia/Pacific
<b>Firm orders for Stage 3 modifications</b>						
Nordam	356	244	14	78	9	11
Av Aero	110	99	5	4	2	
Total	466	343	19	82	11	11
<b>Options for Stage 3 modifications</b>						
Nordam	21	9	7	3		2
Av Aero	23	17	6			
Total	44	26	13	3		2
<b>Aircraft not committed for modification</b>						
	397	6	146	67	99	79
<b>Total</b>	<b>907</b>	<b>375</b>	<b>178</b>	<b>152</b>	<b>110</b>	<b>92</b>
<b>DC-9</b>						
DC-9	Globe	North America	Latin America	Europe	Africa/Mid East	Asia/Pacific
<b>Firm orders for Stage 3 modifications</b>						
	475	425	4	44		2
<b>Options for Stage 3 modifications</b>						
	22	14		8		
<b>Aircraft not committed for modification</b>						
	289	145	99	28	7	10
<b>Total</b>	<b>786</b>	<b>584</b>	<b>103</b>	<b>80</b>	<b>7</b>	<b>12</b>

The latin American market may take several more years to develop. By that time available aircraft will be old and will have low values. An economical option for Stage 3 modification is low-cost hushkit programmes.

Raisbeck Engineering and Duganair both have Stage 3 compliance systems that rely on engineering and operational changes rather than modifications to the aircraft's existing hardware.

The Raisbeck system works by using optimised flap settings during take-off and landing. This lowers engine thrust requirements and hence noise emissions. The price of the system starts at \$0.7 million per aircraft for maximum take-off weights (MTOW) up to 166,400lbs; \$1.1 million up to a MTOW of 177,900lbs, and \$1.5–1.8 million up to 209,500lbs. The modification also avoids any performance loss and makes the aircraft quieter on approach.

### 737-100/-200

There are 907 737-100/-200s of the 1,144 originally built in the current global fleet. About half of these, 466, have firm commitments to Stage 3 modification (*see table, this page*). Only another 44 have options. This leaves 397, 44% of the fleet, without a commitment to modification.

Virtually all aircraft in north America have been committed to Stage 3 compliance. Only six aircraft in the US are uncommitted to Stage 3 modification. The data shows how Nordam has taken the majority of the orders. Unlike the older 727 fleet, the 737-200s operated by US majors have been dispersed. This is explained by the arrival of larger models, including the 737-300.

The big remaining operators of 737-200s in north America are America West, Canadian, Delta, Southwest, US

Airways, Vanguard and West Jet. United has scaled back its fleet after parking some and scrapping others.

Several major US carriers placed large numbers of hushkit options. Airlines have now disposed of parts of their 737-200 fleets and no longer require the options they still hold.

The 737-200 fleet in the US is generally in decline. Consequently, 737-200s are leaving north America. Any would-be start-ups in the US or Canada will not find it difficult to acquire hushkitted aircraft, since many are being sold or returned to lessors. The 737-100/-200 modification market in north America is therefore closed, unless more aircraft are imported.

Latin America has the second largest fleet. Only 19 have firm commitments and another 13 hold options. This leaves 146 without a commitment to Stage 3 modification.

The majority of these are operated by Aero Continente, Aero Peru, Copa, Ladeco, Lan Chile, Lapa, Varig and VASP. One of these, Lan Chile, has been acquiring non-hushkitted aircraft from British Airways.

These airlines are not required to meet Stage 3 compliance, although a few will be if they are to continue flying into US airspace. Like the 727, future Stage 3 legislation may later create a 737-200 hushkitting market in Latin America.

The next largest fleet is in Europe. Eighty-two have been kept and modified. This includes used fleets operated by Ryanair and Euralair. Only another three hushkit options are held by European lessors.

The remaining 67 aircraft in the European fleet have not made any commitment to Stage 3 modification. This includes BA's fleet of 24 aircraft, which are gradually being sold. Some have been sold to GECAS, which has leased the aircraft to Lan Chile.

This group also includes aircraft operated in east Europe by Croatia Airlines, Malev, Riga Air, Transaero and Ukraine International.

Many of these aircraft are flown into EC airspace and will soon be prevented from doing so if the EC's proposed ruling goes ahead. If the ruling is passed, because these airlines have not already committed to modifying these aircraft, they will be forced either to limit their operation to outside the EC or sell them and acquire Stage 3 compliant aircraft. Sales could theoretically be into north America.

If the ruling is not passed – and it is facing severe opposition – these airlines will then be permitted to keep their aircraft and this would re-open a respectable market in Europe.

However, the major and secondary carriers are off-loading their fleets.

Demand for 737-200s in the future is likely to come from Africa, poorer parts of Asia and from Latin America.

Africa and the Middle East have 110 aircraft, but only 11 of Royal Air Maroc's are modified. The 99 not committed are operated by a large number of carriers. These include Air Algerie, Air Gabon, Air Madagascar, Cameroon Airlines, Saudia, TAAG Angola, Tunis Air, Aerosweet and Yemenia. These are likely to be kept in operation.

There are 79 aircraft in the Asia Pacific. Only a few that are operated by Air New Zealand and All Nippon have been hushkitted.

This leaves 441 aircraft either with options or with no commitment to modification. Because the 737-200 secondary market is less defined than the 727 market, there will be less demand to keep the aircraft in north America and Europe. This will minimise the remaining market. The dropping of the EC's proposal could mean that most aircraft will remain and receive modification. Otherwise the hushkit providers will have to depend on latin America.

## DC-9

The DC-9 is older than the 737-200, but perhaps curiously, the DC-9 has remained more popular in the US than

the 737-200. Of the 976 DC-9s built, 786 are still active, 584 of these being in north America.

Globally 475 of the fleet have been committed to modification. This is split between 425 in north America, 44 in Europe, four in Latin America and two in Asia.

Nearly half the north American fleet is accounted for by Northwest's massive fleet of 181 aircraft. Other large fleets are Air Canada (19), Airborne Express (ABX; 72), TWA (58), US Airways (49), AirTran (40), Midwest Express (24), Continental (24) and 53 used by the US Air Force (USAF) and the US Navy (USN). Of these, 375 have firm hushkit commitments and another 10 have options. Another four options are held by two other carriers.

Other operators with hushkit commitments include Air Canada, Midwest Express, Evergreen, Great American Airlines, Independent Air Freighters, Kitty Hawk Cargo, Spirit Airlines and USA Jet.

There are 145 aircraft without hushkit commitments. The 53 operated by USAF and the USN are exempt. The same applies to Hawaiian's fleet. The others are older aircraft operated by TWA, Northwest, US Airways, Continental, Emery Air Canada, ABX and various smaller airlines.

Although the DC-9 is popular, these unmodified aircraft are now due for fleet retirement. They will be sold or scrapped for parts rather than modified. Like the 727 and 737-200, the DC-9's prime secondary market is Latin America.

Latin America has a large DC-9 fleet, only four of which are modified. Even if the continent brings in Stage 3 compliance, the age of the DC-9s means it is unlikely that airlines will modify their old aircraft. There are 99 aircraft with no commitments.

Europe still has 80 aircraft. Finnair, SAS and Aviaco are the largest hushkitted fleets. JAT holds options for seven hushkits, but these could be scuppered by the EC's proposed ruling.

There are also 28 aircraft without hushkit commitments. These include two SAS aircraft and the fleets operated by Binter Canarias, Eurofly, Macedonian, Meridiana, Alitalia and Iberia. These older aircraft will be sold to Latin America, Africa and Asia. Very small fleets operate in Africa, the Middle East and Asia.

Although there are 289 DC-9s around the globe that do not have a commitment to hushkitting, very few are likely to be modified. The DC-9's secondary market is limited to scrapping for parts and sales into latin America. The 173 aircraft in Europe and north



America have been parked or are coming due for retirement, replacement and lease expiry. Few will therefore be hushkitted.

Soon good-quality hushkitted aircraft will start to be retired and sold and this will further prevent demand for any more Stage 3 modifications.

## DC-8 & 707

Stage 3 hushkits have been certified for the DC-8-50/-60 series and the 707 in the past year. QTV has certified its system for the DC-8 and Burbank Aeronautical for the 707. Both companies aim to have their hushkits certified for both aircraft.

The long-range performance of the DC-8 and 707 means there is a stronger need for aircraft based outside north America and the EC which operate into these regions to be modified. This increases the potential hushkit market for these two aircraft, although there is still the uncertainty of the EC's proposed ruling.

There are now 118 DC-8-50/-60s in the global fleet. Thirteen are in storage. A small fleet of eight are operated in Europe while there are 82 in north America, including nine parked aircraft.

Some of the 73 aircraft in service in north America are used by small

package operators and other freight operators that depend on the type to interline containers with the 727. The same applies to aircraft in Latin America, which has a fleet of eight.

Combining these aircraft with the 10 in west Europe and the 14 in other parts of the world puts the maximum potential DC-8 hushkit market at 105.

The 707 fleet constitutes 135 aircraft. Only 24 are active in north America. Another 11 are in Latin America and these are potential modification candidates, as are a small fleet of five in west Europe.

Another 70 707s are active in other regions of the world, especially Africa and the Middle East. Many of these operate into Europe and north America and will require hushkitting. The 707 hushkit market could therefore be as high as 130 aircraft.

If the EC's proposed ruling goes ahead the outcome will be disastrous, not only for the 707 and DC-8 hushkit market, but for the whole 707 and DC-8 freight business as well. A large number of freight carriers all over the world rely on being able to operate these aircraft into Europe.

Prevention of their operation will force them to acquire younger types, such the A310, which will be uneconomic for them to operate.

*Hushkits are essential for the DC-8-50/60 series and 707 and the airlines that operate them. The potential market is large, but could be more than halved if the EC's proposed ruling is passed.*

## Summary

The strength of the remaining hushkit market depends on secondary market for Stage 2 and Stage 3 modified aircraft, as well as developments in Europe. What should also not be overlooked is the trading of hushkitted engines which will dampen the market for new modifications.

Several hundred hushkitted 727s are currently held by the US majors. These could soon be retired in enough numbers to satisfy any future demand for hushkitted aircraft.

The north American and European 737-200 and DC-9 hushkitting markets are virtually exhausted. The market for used hushkitted 737-200s and DC9s is limited.

The 707 and DC-8 market is potentially large, but hangs in the balance on what finally happens in Europe. If Europe is successful in getting its way, then the potential 707 and DC-8 market will be more than halved. **AC**