

Traffic growth and aircraft retirements means 2,200-2,400 new freighters will be required over the next 20 years. The number will be even larger if Stage 4 kills the 727. The majority of new aircraft will be conversions of current passenger models. The favourites for conversion are analysed.

Where will all the new freighters come from?

Predicting which aircraft will be the favourite candidates for conversion is one of the freight sector's largest challenges. This is coupled with estimating how many of each type might get converted. The calculated number will determine which conversion programmes will be popular and require extra capacity. It will also dictate the secondary markets for used passenger aircraft and determine a disposal programme for many of their operators.

The three main elements which influence this are the current fleet, the predicted growth and fleet size in the future and expected rate of retirement.

Freight traffic

Freight traffic is well known to be growing at about twice the rate of global passenger traffic. Naturally this growth has to be satisfied by an increase in capacity and new aircraft.

Capacity comes in various forms, the main two subdivisions being dedicated freighters and passenger aircraft belly capacity.

While passenger aircraft belly capacity and the Asia-Pacific crisis has dented the short-term need for the freighter fleet to grow, long-term expectations are for traffic growth to remain positive and strong enough to stimulate demand for a steady stream of new freighter aircraft for the next 20 years.

Freight traffic cumulative growth is forecast to be a global average of 6.4% for the next 20 years.

Freighter fleet

The global fleet of freighters is about 1,350 aircraft. Boeing divides freighter types into four categories of large and medium widebodies and medium and small narrowbodies.

Large widebodies are the 747, MD-11 and DC-10-30/-40. Medium widebodies are the DC-10-10, L-1011, A300, 767 and A310.

Medium narrowbodies are the DC-8, 707 and 757. Small narrowbodies are all smaller types, including the 727, 737 and DC-9.

The fleet of small narrowbodies totals about 550 aircraft and is comprised 727-100s, -200s, 737s and DC-9s. The 737 and DC-9 are a minority of the fleet while there are about 500 727-100/-200s. The 727 is operated in large numbers by US express package carriers, especially UPS, FedEx, DHL and Emery. The 727 freighter fleet is constantly growing, despite several ageing aircraft issues which have affected its popularity.

The 727 freighter fleet is split between the smaller -100 and -200. There is also a wide range of ages in the 727 fleet. The oldest -100s are now about 32 years old, and the youngest -200s are now 18 years. The 727-100s are expected to begin retiring in the next few years, as are older -200s.

The DC-9 and 737 freighter fleets are not growing and this is expected to remain the case. The 727-200, with the lowest market value for its size, provides better economics and so remains the most popular aircraft. The 727 has also remained popular because it shares the

same cross-section as the DC-8 and this has aided efficient interlining in the US domestic market.

The medium-sized narrowbody fleet includes about 80 757s, but is mainly accounted for by the DC-8 and 707. The current fleet in this category is about 350 aircraft.

The DC-8 and 707 are now old, with the youngest aircraft more than 20 years old. The DC-8 has been particularly popular and is also durable. The two aircraft are now showing signs of increasing maintenance costs as components and engine modules get into short supply. These are expected to retire from service in the next five years.

The DC-8-70 series will remain popular, on account on them being the largest and youngest models, but are still about 30 years old and so will retire over the next 20 years and have to be replaced.

Traffic growth, especially in the express package market, will mean larger aircraft are required. Most of the medium-sized narrowbody category is expected to be replaced by medium-sized, twin-engine widebodies. This in particular will be types such as the A300, A310 and 767.

A few 757s also operate, but so far all of these have been new-build aircraft. To date the value of 757s has remained too high to be economic conversion candidates. This has recently changed with British Airways' fleet having been sold to Boeing to be converted under the original equipment manufacturer's (OEM) programme. This may now start a flow of 757 disposals from other 757

SUMMARY OF CURRENT FREIGHT FLEET, FORECAST RETIREMENTS AND FLEET ADDITIONS FOR 20 YEARS

Fleet category	Small narrowbodies	Medium narrowbodies	Medium widebodies	Large widebodies
Current fleet	550	350	200	245
Forecast retirements	450	270	35	100
Future fleet	1,000	260	700	800
Fleet additions	900	180	540	660
Current types	DC-9/737-200/ 727-100/-200	DC-8/707/ 757-200	A300/A310/767/ L-1011/DC-10-10	DC-10-30/-40/ MD-11/747
Replacement & growth candidates	737-300/-400/ 757-200	757-200	A300-600/A310/ 767	DC-10-30/-40 MD-11/747

operators. The 757 has similar payload characteristics to the DC-8-50 and 707. Despite the 757's higher market value, it has several operating cost advantages that should make it an economic DC-8/707 replacement candidate (see *New freighters for long-thin markets, Aircraft Commerce, November/December 1999, page 44*).

The size of this category is, however, expected to contract, while the next largest is expected to grow as most DC-8s and 707s get replaced with the smaller twin-engine widebodies.

The medium-sized widebody has the most types. The two largest are the DC-10-10 and L-1011. These are unique in the respect that the fleet of 100 DC-10-10s will be solely operated by FedEx and Emery and there is a limited number of L-1011s converted to freighters.

There are about 200 aircraft in this category, and the majority of these are smaller twin-engined widebodies. This sector has also grown the fastest in the past six to eight years. The A300B4, A310, A300-600 and 767 have all entered the freight market in this time. The sector will continue to grow as more DC-10-10s get converted and delivered to United.

More A300B4s, A300-600s and 767s are also due for delivery.

There are already 50 converted A300B4s in operation and another 30 committed to conversion and due for delivery. There is also about 40 A310-200s and another 40 A300-600s in operation. UPS has 20 aircraft on order

and these will be delivered over the course of the next five years.

There is 32 factory-built 767-300Fs in service and another nine 767-200Fs, converted under the ABX programme in operation. More 767-200s may be converted.

There is a small fleet of about 10 L-1011s in operation and FedEx has so far taken delivery of about 30 DC-10-10s/MD-10-10s. This will grow as the remainder of the aircraft in the programme are delivered.

This category is therefore scheduled to grow by another 90 units over the next five years on account of MD-10 and A300-600 orders for FedEx and UPS. Outstanding options could increase this category further still.

The category of large widebodies includes the DC-10-30/-40, MD-11 and 747. There are currently about 245 aircraft in this group, and all models are popular. This category is also expected to experience a large increase.

The DC-10-30 is operated in small amounts and FedEx has the largest fleet. There are a few other small DC-10-30F operators, but they each have small fleets. The DC-10-30 is a good long-range aircraft for FedEx, but is otherwise used as an aircraft between north and south America.

There are only about 50 DC-10-30/-40s operating, but this will grow as more aircraft committed to conversion get delivered, although not all have committed leases.

The MD-11 is a popular freighter and

70 are in operation. Some of American's and Korean Air's fleet have been converted. The remainder of American's fleet and Swissair's fleet have also been committed to conversion.

A minority of the 140 747 freighters operating are factory built aircraft. The remainder are converted -100s and -200s.

The oldest 747s are now approaching 30 years have already experienced several ageing aircraft problems and are becoming more expensive to maintain. The oldest aircraft also have the poorest payload-range performance of all 747 models. Younger and more capable 747s can now be acquired at low rates (see *The merits and pitfalls of buying used 747-200s, Aircraft Commerce, November/December 1999, page 13*). All these pressures mean a large number, and possibly all, the current 747-100 and -200 freighters will be retired over the next 20 years.

Fleet retirements

Boeing predicts that over the next 20 years about 75% of the current fleet will retire. This is equal to about 850-900 aircraft.

Freight aircraft are operated at low utilisations and so generally survive until an age of 30-40 years. The retirement of aircraft is dictated by noise and environmental regulations, rising maintenance costs and younger aircraft offering better costs; mainly because of falling values.

The biggest threat to the viability of older freight types is the possibility of Stage 4 noise regulations. Further hushkit modifications are unlikely to allow Stage 3 modified aircraft to meet Stage 4. This could then bring early retirement of even the youngest Stage 3 modified aircraft.

All DC-9, 737 and 727-100 freighters are more than 20 years old and so will all retire in the next 20 years. The majority of 727-200s would also be expected to retire. Only about 100 of the youngest 727-200s currently operating are likely to remain in service in 20 years. The one factor that could alter this is imposition of Stage 4 noise rules, bringing about the retirement of all 260 727-200Fs in service.

Despite their appeal, all DC-8-70s and other DC-8 variants and all 60 707s will all be retired in the next 20 years.

About half the A300B4s already in service will probably retire, as well as some of the older ones still being converted and not yet delivered. In contrast the A310, A300-600 and 767F are all young and so will still be operating. FedEx's DC-10-10s have been put through a life extension programme and so kept, while the L-1011s are likely to be retired.

Of the large widebody category,



about 15 of the older DC-10-30/-40s are now more than 20 years old and could retire. All MD-11s are likely to remain in service over this period, while all 747-100Fs, and majority of 747-200s will probably retire. In addition to these some of the older DC-10s and 747-200s not yet converted will probably be retired during the next 20 years.

Of the current freighters in operation, at least 850 aircraft from the four categories may get retired. This number will be higher if the 727-200 is adversely affected by a possible Stage 4 ruling. In this case up to 950 aircraft of the current fleet of 1,350 will be retired.

Fleet growth

By Boeing's prediction of an average annual growth of 6.4%, the current fleet will have had to grow to about 2,750 aircraft in 20 years. This is a net increase of 1,400 units over the period. With the expected number of retirements 2,200-2,400 new aircraft will have to be added. A minority of these will be factory-built aircraft, but at least 75% or 1,700 will have to be converted used aircraft. This prediction may overestimate the industry's capacity to acquire new aircraft, especially when there will be a large number of used passenger aircraft available.

Boeing estimates the small narrowbody category will have to reach about 1,000 units in 20 years. This is a net increase of 450 aircraft. With retirements the number of new units will have to be 900-1,000.

The medium narrowbody category but will decline to about 260 aircraft. Considering the number of expected DC-8 and 707 retirements, about 180 new aircraft will have to be added. This includes the 35 ex-British Airways aircraft already committed to conversion.

The medium widebody fleet is expected to reach about 700 aircraft. Considering the 35 predicted retirements, about 535 aircraft will have to be added. This includes the DC-10-10s, A300B4s, A300-600s and A310s currently on order and due for delivery.

The fleet of large widebodies is expected to grow to about 800 aircraft. With about 100 of the current fleet retiring, about 660 aircraft will have to be added over the next 20 years. This includes the 20 or so American and Swissair MD-11s already committed to conversion and a large number of DC-10s already committed to conversion.

This brings the total number of aircraft that have to be added to about 2,300.

In each category the candidates that will come available for conversion will exceed the number required. In fact, in all cases there are already enough candidates to satisfy the demand.

Small narrowbodies

In the small narrowbody class the 737-200, -300 and -400 all stand as potential DC-9, 737-200 and 727-100 replacement candidates. There are a large number of passenger 727-200s remaining as strong conversion candidates. These

The A300B4 has been the first converted widebody twin to enter the market. Few conversion candidates are left. The A300-600 is most likely to follow, but these are also limited in number. This will still leave a market for at least 200 767 conversions.

could replace both older 727-200s and 727-100s, and satisfy traffic growth. The 757 also stands as a fleet growth candidate.

About 640 727-200s remain in operation. The majority of these have already been Stage 3 modified. The large fleets are operated by American (70), Delta (112), United (75), Northwest (36), Iberia (26), American Trans Air (26) and TWA (26). There are also Stage 2 aircraft returned by Continental to lessors.

Many of the 727 fleets are operated by Central and South American airlines. This probably leaves just the European and North American aircraft as conversion candidates.

Delta's aircraft are committed to hushkitting with the Feasi system and have already been sold to Republic. The aircraft have high engine power and so from two respects are strong conversion candidates. The majority of the aircraft are 20-25 years old. It is still likely that about 100 will be converted. Some of TWA's older aircraft are likely to be scrapped, as are others from US airlines.

Considering the large number of aircraft required in this category almost all 370 western operated 727-200s are good candidates. It is also possible that other non Stage 3 modified units, such as those operated by carriers such as Air Algerie, Comair, Continental and Mexicana would also get converted.

Conversion of 350 727-200s would still only satisfy less than half the demand for additional units in this class. The remaining 550 units required would have to come from conversion of types such as the 737-300 and -400. Pending Stage 4 legislation could damage the market for 727 conversions. This would then mean 1,000 737s or other types, such as the MD-80 or 757 would have to be converted to entirely replace this segment of the market.

The 737-300 and -400 are good 727-100, 737-200 and DC-9 replacement candidates with respect to size and cash operating costs. Once market values have fallen enough the 737-300 and -400 will be able to displace the 727-100 and other types. This may only be a few years away. The market for 737-300 and -400 conversions could then be as high as 300 units.

The 737-400 is too small to replace the 727-200, and this would have to be done by the MD-80 or 757 if Stage 4

The large freighter sector will be supplied by almost all DC-10-30s and MD-11s not yet converted. Growth in this sector will still leave potential for at least 300 747 conversions. A conversion programme for the 747-400 may be required in about 10 years.

legislation made the 727-200 obsolete. Whether or not Stage 4 legislation affects the viability of the 727, there are enough narrowbody aircraft to supply this category. There are more than 1,500 737-300s and -400s and nearly 800 757-200s in operation.

The 727 will be the preferred aircraft on account of their low value. The oldest 757s are already low enough to be competitive against the DC-8-50 and 707. Values will also be low enough within 5-10 years for the 757-200 to be competitive against the 727-200 in a low utilisation operation.

Medium narrowbodies

The 757 is also the only aircraft that can provide the 180 new aircraft in the medium narrowbody class. The small number required means the 757-200 will easily provide all the aircraft required.

Medium widebodies

The types that could fill demand in this category are the A300B4, A310-300, A300-600 and 767.

Of the 550 additional aircraft required, 30 will be supplied by the current overhang of A300B4s committed to conversion but not yet in service. There are another 70 A300B4 passenger aircraft, but only about 20 are regarded as strong conversion candidates by A300B4 lessors.

The few remaining A300B4 candidates will soon lead to the industry selecting from the A310-300, A300-600 and 767 for another 500 aircraft over the next 20 years.

Although values are falling, many regard the A310-300 as being unfavourable because it has similar trip costs, a smaller payload and only a slightly longer range than the A300-600.

The contest will largely be between the 767 and A300-600. The more popular aircraft will be the A300-600, since its values have fallen lower than the 767's. The A300-600 will also be preferred because it can share the same containers as the A300B4 and A310 already in service. The A300-600 is also expected to retire sooner than the 767.

There are about 190 A300-600s in passenger service. Most of these will be able to satisfy part of the demand. What



cannot be predicted is when the passenger A300-600s in operation will become available.

The balance of the demand over the 20 year period could be partially met by the 20 factory-built A300-600s on order for UPS and the 70 DC-10-10s committed to conversion.

The balance of the requirement of about 200 units could be met by the A310 and 767. These aircraft will be for long-range operations and will be good replacements for the DC-8-70s. The market for 767 conversions could therefore be at least 200, and even more depending on the number of passenger A300-600s that get converted.

Large widebodies

The 660 aircraft required in this category will almost certainly be provided first by the remaining DC-10-30/-40s and MD-11s not yet in service as freighters.

Of the 350 civil DC-10s in operation, about 240 are -30/-40 models. Of these 47 are already freighters. Another 17 are committed to conversion, leaving 176 more passenger aircraft as conversion candidates. About 30 of these will probably be converted in the next six years.

The largest remaining fleets are operated by Northwest, Canadian, AOM, Iberia and Garuda. Large fleets have also been retired by Continental and British Airways.

Most remaining DC-10s are likely to get converted to freighters. This would still leave a market for at least 470 aircraft in this category. This could first be satisfied by the 120 remaining passenger configured MD-11s. About 30

are already committed to freight conversion, but all are young and will be retired by passenger operators.

There would then be the requirement for a further 350 aircraft. This would be left to just the 747.

The first ones to be considered are the remaining -200s. Industry analysts expect about 20 -200 combis to be converted and 75-80 of the best -200 passenger models. These are expected to be the CF6-powered and higher thrust variant JT9D-powered models. The RB211-powered aircraft are least favourable because of their heavy empty weight.

This still leaves about 250 aircraft, which would have to be satisfied by conversions of -300s and -400s or factory-built -400s. The RB211-powered -300s are likely to be unpopular, because of their weight disadvantage, leaving about 44 CF6- and JT9D-powered aircraft.

The oldest 747-400s are now 11 years old and a conversion programme is expected to materialise in about another 10 years when values have fallen low enough. At least 210 747-400s would then have to be converted.

Summary

The market for certain types is healthy. The 737-300/-400 and 757-200 each should have no problems in securing orders for several hundred conversions. This will be even larger if Stage 4 noise rules damage the 727.

All A300-600s made available should get converted, still leaving a market for 767s. All DC-10s and MD-11s could get converted, with at least 300 747s being acquired.

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