

Some express package airlines have large fleets of old aircraft, while others in many parts of the world are still experiencing high growth rates. There are now three main narrowbody aircraft types to choose from. The main factors influencing selection are analysed here.

Narrowbody selection for express package operations

Express package operations are dominated by US carriers, but other airlines are experiencing high growth rates and having to evolve fleet plans quickly to keep up with commercial development.

Airlines experiencing the highest growth rates are based in the developing regions of the world. Many have small fleets and underdeveloped route networks, and are a fertile market for narrowbody freighters. This article analyses selection of narrowbody freighters, and some possible markets for the aircraft.

Express package operators

The express package market in the US has stagnated in recent years, although it recovered strongly in 2004. US airlines dominate the express package market, and there has been consolidation in recent years. Airborne Express (ABX) will merge with Astar Air Cargo, thereby leaving the US with three dominant airlines, including United Parcel Service (UPS) and FedEx.

Demand for narrowbody aircraft depends on airline development. UPS and FedEx have large mature operations in the US. No more air routes or flight frequencies are likely to be added, and some operations by air have in fact been replaced by ground transport. Any increase in air freight volumes will be absorbed first by higher load factors and then an increase in aircraft gauge. The number of widebodies used by these airlines has steadily increased over the past 15 years. Which aircraft type FedEx will use to replace its 727s remains in question. UPS and FedEx also have

extensive operations in the Asia Pacific, but use widebodies for these networks.

The third major express package airline in the US is the combined fleets of ABX and Astar Air Cargo. Astar, previously DHL Airways, operates six A300B4s, nine DC-8s and 26 727s. ABX has a fleet of almost 140 aircraft. About half are DC-9s, and the remainder a mixture of DC-8s and 767s. These two carriers will have a combined fleet of about 180, of which more than half are narrowbodies. Although merging operations may result in some consolidation, the airline is a candidate for narrowbody aircraft.

Other US airlines include Capital Cargo, Custom Air Transport, Express.Net, Express One International and Kitty Hawk.

Kitty Hawk operates a fleet of 23 727-200Fs, dating from 1969 to 1975. Kitty Hawk will replace some of them with 737-300SFs, and will be the first to operate the aircraft when it takes delivery of the first of seven.

Kitty Hawk has signed 10-year leases on the seven aircraft, with options to extend operations further.

The aircraft come from GECAS's portfolio of converted 737-300s, modified by Israel Aircraft Industries (IAI). These converted aircraft will be delivered late, however, with the first originally due in late 2004.

"The 737-300SF is a significant step toward enhancing the Kitty Hawk fleet and preparing our company for the future," says Robert Zoller, president and chief executive officer at Kitty Hawk. "As such, the 737-300SF will provide lower operating and maintenance costs for our company."

Canada

Canada has four main airlines operating express package services: AllCanada Express, Cargojet Canada, Kelowna Flightcraft and Morningstar Express. These have a combined fleet of more than 35 727s.

Europe

Europe has the second largest group of airlines carrying express packages, although the airlines are collectively a fraction of the size of US airlines.

EAT is the largest, and has a fleet of A300s and 757s having already selected its narrowbody fleet. TNT has a fleet of 16 aircraft, including 11 BAE 146s and a single 737-300.

Other airlines in Europe include Star Air, which operates contract services for UPS with a fleet of 757s and 727s. Air Jet of France has two BAE 146s, and Air Mediterranee has two 737s.

Europe Airpost

Europe Airpost operates mail and cargo flights for the French Post Office during the night, and scheduled and charter services for Air France and Flywest during the day. It has two 737-300 freighters, which were built in 1993 and 1994, and 11 737-300 QCs. "Our business comprises two parts. One is cargo and express packages, accounting for 73% of the turnover. The other is passenger business. The income from express packages accounts for about 40% of revenue. Our express package business is mainly based on the operation of the French Post Office," says Jean-Claude



Billot, technical manager at Europe Airpost. "At the current stage, we have no plans to acquire new aircraft. However, we may have some opportunities to change our current fleet. The first reason is that we want to improve our asset management and reduce operating cost. As our business is diversified, the 737-300QC is obviously more suitable for our company. So in the future, we will consider replacing the current two 737-200Fs with 737-300QCs."

Air Contractors of Ireland operates contract services for EAT and has a mixed fleet of eight A300s and 727s. Other airlines include Cougar Airways, Channel Express, and West Air of Sweden.

Australia

Australia is the other global region to have an established express package freighter operation. The five main carriers are Air Cargo Australia, Asia Express Airlines, Australian Air Express, Independent Air Freighters and National Jet Airways. These have a combined fleet of more than 14 727s.

Other regions of the world have fast growing express package carriers which are developing from a small base. Most notable are airlines in Central America, India and China.

Estafeta Carga Aerea

Estafeta operates domestic services in Mexico and the US, and has over 25 interline agreements providing connecting services to the rest of the Americas, Europe and Asia. It operates four 737-

200Cs. "Annual growth rates have been 9-12% higher than expected over the past three years," says Juan Rodriguez Anza, director general at Estafeta. "To accommodate the rapid growth, we currently want to increase the monthly aircraft utilisation from 110 flight hours (FH) to 150FH. We have no immediate need to replace the current fleet, but we may add one or two converted 757s. We will select new aircraft on the basis of capability and lease rate, and will be looking for a rate below \$200,000 per month. The aircraft's monthly utilisation will be 170-180FH."

Blue Dart

Blue Dart Aviation is an express airline with scheduled night operations in India. It has five 737-200s, which were built from 1975 to 1988. This carrier has recorded double-digit growth rates in recent years. The most striking change to happen in recent years was that in December 2004 India's government granted for DHL Express approval to buy a stake in Blue Dart.

"We want to acquire some aircraft with a 30-ton payload to meet the development of this market," says Vishok Mansingh, general manager of materials at Blue Dart Aviation. "We need these aircraft to join our fleet in 2007. We are open to any options, whether it is Boeing or Airbus aircraft, but the main consideration is the payload capacity."

China Postal Airlines

China Postal now operates Chinese domestic services and also to Osaka in Japan with two 737-300QCs and two

Other than Boeing's passenger-to-freighter modification for the 757, other conversion programmes for the aircraft that allow 15 or 14 and a half maindeck containers will soon receive their STCs. These modifications provide 20% more volumetric capacity for express packages than the 727-200F.

737-300s. Thanks to China's economic boom, China Postal Airlines recorded an annual traffic growth of about 10%. The carrier aims to add services to Hong Kong, South Korea and other Asian countries over the next few years with 737-300s and potentially larger aircraft, such as 757-200s.

China Postal Airlines is a joint venture established by China Southern Airlines and the China Post Office. China Southern holds 49% of the shares in this company and China Post Office the remainder. The ownership structure guarantees the cheap and efficient acquisition by China Postal of aircraft from China Southern, and is an outlet for the latter to retire its old aircraft.

The collaboration benefits the two airlines operating the 737-300QC. The aircraft is operated by China Southern Airlines during the day and used by China Postal at night.

China Postal Airlines selected Israel Aircraft Industries (IAI) to convert to freighter at least three 737-300s currently operated by China Southern Airlines.

The first 737-300s will be delivered to IAI's new partner, Guangzhou Aircraft Maintenance Engineering (GAMECO), in late 2005 and will be delivered to China Postal 4-5 months later. IAI has signed GAMECO as a sub-contractor to install 737 conversion kits for potential Chinese and overseas customers using IAI's supplemental type certificate (STC).

GECAS owns at least one of the China Southern 737-300s reserved for conversion at GAMECO. GECAS is keen to convert the ageing aircraft operating in China in its portfolio. A restriction preventing aircraft that are more than 15 years old from being imported into China means that there is a limited pool of aircraft available for the fast-growing Chinese cargo market, and so it is in lessors' interests to keep aircraft in China that are already locally registered.

Other lessors which own China Southern's 737-300s are also keen to convert these aircraft in China and may also lease them to China Postal. This carrier plans to add three 737-300Fs next year to replace its fleet of five Shaanxi Y-8s.

China Postal estimates that it will add another 10 aircraft, mainly 737-300s, between 2006 and 2010. China Southern,

which is phasing out its fleet of nearly 30 737-300s in favour of new Airbus A320s and 737-700s, is the likely source of these aircraft. China Postal also plans to take over two 737-300QCs currently operated by China Southern.

Although it is strongly supported by China Southern and benefits from China's booming economy, China Postal is facing fierce competition from UPS, DHL and other express package carriers.

Whether China Postal can enter the Hong Kong market mainly depends on the outcome of air service talks between Hong Kong and China. If the outcome allows China Postal to enter this market, then Hong Kong's express package carrier, Air Hong Kong, 40% of whose shares are held by DHL, can operate in mainland China. China Postal will therefore face a new and strong competitor.

Aircraft selection

The potential for narrowbody freighters is twofold: the replacement of 727s; and adding capacity to increase gauge from smaller jets like the BAe 146 or turboprops, or even adding new routes.

There are three main types to consider: the 757-200, 737-300 and later the 737-400, a STC for a conversion modification has been issued. There is also the possibility of the 737-200, which can provide airlines with capacity at low cost. These all share the same fuselage cross-section. One standard container that can be used is the 125-inch wide, 88-inch long and 82-inch tall contoured container, which has an internal volume of 440 cubic feet. The payload capacity of each aircraft is thus determined by the number of these containers they can accommodate on their maindecks, plus any additional half-size or small containers and underfloor freight.

These aircraft have to be considered against the older types. The 727-200 is the dominant aircraft, and carries 12 standard containers, which give it a maindeck volume of 5,280 cubic feet. It has additional lower deck space that takes its total volume to 6,715 cubic feet. Packed at a density of 6.5lbs per cubic foot, the aircraft has a volumetric payload of 43,648lbs.

The smaller 727-100 can carry nine of the same containers. Overall, the aircraft has a freight volume of 4,860 cubic feet and volumetric payload of 31,590lbs at the same packing density.

Other types of small jet freighters include the DC-9 and BAe 146. The DC-9 has a maindeck volume of 4,221 cubic feet, plus some additional lower-deck space that takes its total volume to just over 5,000 cubic feet. Volumetric payload will be 32,500lbs.

The BAe 146 has a useable maindeck volume of 2,234 cubic feet. Added underfloor space takes total volume to about 2,600 cubic feet, thereby giving the aircraft a volumetric payload of 16,900lbs.

Larger turboprops include the Lockheed L-188. This has a useable maindeck volume of 3,700 cubic feet, making it larger than the BAe 146.

There is also the 737-200, which is operated in small numbers by carriers such as Blue Dart and Estafeta. The aircraft can carry seven of the standard maindeck containers plus a smaller one that is 108 inches long. These eight have a maindeck volume of 3,432 cubic feet; added to the underfloor space of 875 cubic feet this means the aircraft has a total of 4,307 cubic feet and a volumetric

payload of 27,995lbs.

These older freighter types have capacities between 2,600 and 5,280 cubic feet and volumetric payloads from 16,900lbs and 43,600lbs.

The 737-300/-400 and 757-200 that are available to replace the older types have volumes between 4,740 and 8,390 cubic feet (see table, page 56). With the standard packing density of 6.5lbs per cubic foot, they have volumetric payloads of 30,810-54,535lbs (see table, page 56).

The 737-200 could also be considered, although Stage 3 compliance and the expense of making an aircraft airworthy when re-registering it in a new country have to be carefully assessed. Two conversions for the 737-200 are available from AEI and Stambaugh Aviation.

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PAYLOAD CHARACTERISTICS OF NARROWBODY FREIGHTERS

Aircraft type	737-300F	737-400F	757-200SF Alcoa-SIE	757-200SF Precision
Number of maindeck containers	8 + 1	9 + 1	14 + 1	15
Main container type	125/88/82	125/88/82	125/88/82	125/88/82
Maindeck container volume-cu ft	3,672	4,112	6,540	6,600
Total useable volume-cu ft	4,740	5,476	8,330	8,390
Volumetric payload-lbs	30,810	35,594	54,145	54,535

757-200

The 757-200 converted by Precision Conversions has the largest useable volume and volumetric payload. It is the only conversion for the aircraft to provide 15 standard containers on the maindeck, giving it a useable maindeck volume of 6,600 cubic feet. Underfloor volume takes the aircraft total to 8,390 cubic feet, giving it a volumetric payload of 54,535lbs (see table, this page).

The conversion has a list price of \$4.5 million, and Precision Conversions is due to receive its STC in March or April of 2005. The cost of conversion has to be considered with aircraft acquisition and probable airframe, engine and component maintenance, the total cost for producing a freighter will be in the region of \$20-22 million, depending on the aircraft acquisition price.

The alternative conversion for the 757-200 is the Alcoa-SIE modification. This is cheaper, with a standard conversion price of \$3.75 million, including cargo handling system. Alcoa-SIE's conversion differs in that it only allows 14 standard maindeck containers plus a smaller 15th container. These have a combined useable container volume of 6,540 cubic feet (see table, this page). Added to the underfloor volume of 1,790 cubic feet it gives the aircraft a total volume of 8,330 cubic feet, which translates into a volumetric payload of 54,145lbs.

Alcoa-SIE's first aircraft is being converted and the STC for the modification is expected to be issued by the end of 2005.

The 757 is a large jump in capacity from the 727-200, with an increase in useable volume 3,100 cubic feet to 8,390 cubic feet and increase in volumetric payload of 8,000lbs, a jump of 20%.

737-300

There are two conversions for the 737-300, which are offered by IAI and Pemco. Both modifications have a conversion cost of about \$1.9 million and allow eight standard containers plus a smaller one on the maindeck. This gives the aircraft, converted using either programme, a useable maindeck volume of 3,672 cubic feet (see table, this page). Additional underfloor volume takes total freight volume to 4,740 cubic feet and gives the aircraft a volumetric payload of 30,810lbs (see table, this page). A third conversion for the 737-300 is being developed by AEI.

The 737-300's capacity is similar to, but smaller than, the 727-100's. Conversions for the 737-400 are being developed by IAI and Pemco. The 737-400 can accommodate nine maindeck containers and so has a total useable volume of 5,476 cubic feet and volumetric payload of 35,594lbs (see table, this page). This is more than the 727-100, but still less than the 727-200.

Economics of replacement

Airlines therefore have three main choices for replacing their older aircraft. The fourth option of the 737-200 may provide an economic solution for turboprop and BAE 146 operators. The economic rationale for replacing older aircraft is strong with oil prices in the region of \$55 per barrel and fuel prices more than \$1.10 per US Gallon (USG).

Besides fuel, the other main factor in determining if older aircraft can be economically replaced with the 737 or 757 is the lease rate of the new equipment and aircraft utilisation. Analysis has shown that when the costs of fuel, maintenance, flightcrew and

finance charges are considered, replacement with the 737 and 757 is only economic when the operation results in relatively high utilisations of about 2,500FH per year and when the price of fuel is 110 cents or more per USG (see *How do high fuel prices affect plans for 727F replacement? Aircraft Commerce, December 2004/January 2005, page 43*). Lease rates are \$150,000 for the 737-300, \$170,000 for the -400 and \$200,000 for the 757-200.

On the basis that the 737-300/-400 have equal or similar volumetric payloads to the 727-100, the 727-100 and -200 have trip costs in the region of \$6,500 and \$9,000. Trip costs for the 737-300 and -400 will only be a few hundred dollars higher than the 727-100.

The 757-200 has trip costs that are \$1,000-2,000 higher than the 727-200's. The 757-200, however, has about 20% more capacity than the 727-200. The 757-200 therefore has a lower cost per lb. It can only be justified, however, if its additional freight capacity is required.

Many express package operators have annual rates of aircraft utilisation of less than 1,800FH per year. Under these conditions, the 727-100 and -200 have trip costs \$1,500-2,500 less than the 737-300 and -400, and the 727-200's trip costs are about \$3,000 less than the 757's.

Under these circumstances, some operators may still be able to justify replacing their 727-200s with the 757-200, while replacement of 727-100s with the 737-300 or -400 is likely to be uneconomic for most.

Other factors affecting the economics of aircraft will have to change to bring about a faster rate of replacement of older aircraft. Lease rates for the 757 and 737-300/-400 will have to decrease, fuel prices will have to remain high, or maintenance costs of older aircraft will have to rise to unacceptable levels.

A higher availability of 737-300s/-400s and 757s will bring down their market values and so the total cost of preparing them for service as freighters. As an example, \$12 million of the \$20 million total for preparing a 757 freighter for service is the cost of acquiring a used passenger aircraft. A \$4-5 million drop in market values will have a significant effect on the freighter aircraft's monthly finance charges, and consequently make it more viable against the 727-200. The 737-300 and -400 will be more attractive with market values less than \$4 and \$9 million respectively. This will push the total cost of preparing these types for service as freighters down to less than \$8 million and \$13 million respectively. A total cost of \$6-7 million for the 737-300 and \$10-11 million for the 737-400 will bring down their finance charges and make them competitive in most circumstances. **AC**