

The combination of a recovery in the global air freight market and decline in 747-400 market values has triggered the first wave of passenger-to-freighter conversions. How much will airlines and lessors have to invest to prepare an aircraft for service, and what are its market prospects?

The time has come for the 747-400SF

The economic performance of the 747-400SF has previously been analysed compared to the 747-200SF and 747-400F (see *The case for a 747-400 freighter conversion, Aircraft Commerce, August/September 2002, page 42*). This analysis indicated the 747-400SF would have the best economic performance on the basis of its having a monthly lease rate of \$550,000. The Boeing freighter conversion programme for the 747-400 has won 40 orders in recent months. This is for airlines in Asia Pacific region, like Cathay Pacific, Dragonair, Korea Airlines, JAL and All Nippon. Four of the orders are for Guggenheim Aviation Partners, a US leasing company. This recent development raises the issues of what is the cost to acquire, convert and prepare a 747-400SF for service, and how is the market for the converted freighter?

Purchase cost

The current market value of a 747-400 built in 1991 is about \$35 million. The actual price in a deal depends on many factors. Traditionally a passenger airplane will not be converted to a freighter unless its residual value declines to an acceptable level.

Before 1 April 2001, Singapore Airlines (SIA) had a depreciation policy of a useful life of 10 years and residual value of 20%. SIA's five 747-400s purchased by Dragonair were built between 1991 and 1994. Hence, these aircraft were almost fully depreciated. Similarly, the age of Japan Airlines' (JAL) 747-400s to be converted are up to 14 years.

The prices for SIA's 747-400s remain undisclosed and were influenced by Boeing, which will be discussed later, but it is expected that SIA may have sold fully or nearly depreciated aircraft at a respectable residual value. The aircraft

are also relatively young, and so these aircraft have probably been acquired at a good price considering their remaining life.

In the long term, the price of an ageing 747-400 depends on three factors.

The first is the supply of the aircraft. Boeing expects that more than three quarters of freighter fleet additions during the next 20 years, satisfying both market growth and replacement needs, will come from modified passenger and combi airplanes. Nearly half of these conversions will be widebody aircraft. As of December 2003, 41 customers had ordered 651 747-400s. Among these aircraft, 62 are combis. "We expect that there will be 300 -400s to convert up to 2021. Some -400s are not suitable for conversion because they are equipped with Rolls-Royce engines, which increase the empty weight of the aircraft and thus do not justify the conversion," says Dariush Lavian, director marketing of aircraft cargo conversions of Bedek. "As the best age for a -400 to be converted to a freighter is about 15 years old and the first 747-400 was delivered in 1989, the peak of aircraft for sale and available for conversion will occur in about 2008. We expect four, 12 and 12 -400s to convert in 2006, 2007 and 2008 respectively. Among the 12 -400s in 2008, nine will be converted in Bedek while the other three will be converted at our other facilities. In total, we expect to convert 150 aircraft".

The demand for the aircraft is the second factor that has a strong influence on the market value. The demand for freighters is de facto derived from the cargo demand. The converted aircraft is expected to have a performance of carrying 160,000lbs about 6,000nm, which makes the aircraft suitable for trans-Pacific routes. Thus, cargo demand in the future in this region is crucial for

demand for the aircraft. The cargo growth rate in this region is expected to remain at 8% over the next 20 years due to the emergence of world factory in China and global labour division.

The potential demand indicates the strong demand of this aircraft. More encouraging signs are from India, a deregulating aviation market. US leasing company Guggenheim Aviation Partners has acquired four ex-SIA 747-400s through Boeing Aircraft Trading and booked slots with Boeing Commercial Aviation Services for their conversion to freighters between 2006 and 2009. The first two 747-400s will be leased to Air India pending conversion in 2007.

Competitors

The third factor that will affect the -400's price comes from the aircraft's current and potential competitors. As analysed (see *The case for a 747-400 freighter conversion, Aircraft Commerce, August/September 2002, page 42*), the converted aircraft's rivals include the MD-11F, 747-200SF and 747-400F.

There are only a few MD-11Fs in the market and UPS is to take most of them in the coming years. More importantly, the aircraft is unable to fly trans-Pacific routes, which are golden routes for cargo carriers based in Asia Pacific. Hence, MD-11Fs are not possible substitutes for 747-400SFs in some global markets.

Conversely, the 747-400F is still a threat to its passenger-to-cargo peer. The most prominent example is that Nippon Cargo Airlines ordered three -400Fs and Korean Air, China Airlines and Air China Cargo each ordered two and Cargolux ordered one in 2004.

The 747-400F's list price is \$200 million, while the actual probable price offered to potential customers may not exceed \$150 million. With more ageing



747-400s coming available to be converted, however, the factory-built -400F will lose its attraction to airlines.

“Boeing will keep the line open in the next five to 10 years and probably stop producing 747-400Fs at the latest 2012,” predicts Cliff Duke, chief executive officer of PSF Conversion LLP. “Boeing is going to roll out the 777F in 2009, which will have a conflict with 747-400F. Closing 747-400F production line is a certainty”.

Boeing’s 747-400 conversion programme is understood to be a preparation for the post-747-400F age. More importantly, as a rational investor, an airline will seriously compare the return on the investment in a factory-built 747-400F with a 747-400SF. This will become even more valid when the 777F, an alternative to the 747-400F, is to be available in the new future.

“Factory-built 747-400Fs are less economic than converted aircraft, and it therefore makes more business sense for us to purchase second-hand aircraft,” says a spokesperson for Dragonair; an ambitious carrier in Hong Kong with five 747-400SF orders. JAL has the same outlook: “We already own 747-400s. Conversion from passenger to freighter is the most economic way to increase our cargo fleet size”.

Cathay Pacific, the cargo incumbent in Asia Pacific, regards the issue from the time perspective: “It is industrial practice to convert passenger aircraft to freighter. The conversion time is shorter compared to the production of a new freighter. Thus in a way, the 747-400SF can meet the need of the fast growing of cargo business”.

With these comments in mind, how can the orders for factory-built 747-400Fs from other airlines be understood?

“This because the cargo demand is too strong, and although the first orders for 747-400s conversions have been placed, there are currently no other suitable aircraft available,” says Mike Skinner, chief executive officer of AMS Aircraft Ltd.

A potential threat comes from A380F. The aircraft is expected to carry a payload of 330,000lbs over 5,600nm. Stretched, shorter and extended range variants of the baseline version will become available as and when the market requires them, Airbus promises. The A380 is also expected to offer a cost per ton-mile at least 30% lower than that achieved by the 747-400F, 38% less than the MD-11F and 52% less than the 747-200F over distances greater than 4,500nm.

Assuming that the proposed indicators come true, two questions arise: First, which airlines need such high capacity?, and what is the price of the A380F? So far Airbus has announced 17 firm orders for the A380F. “The A380F is only suitable for the routes which have two daily 747-400F flights,” says Alex Wecker, vice president fleet planning & technical contracts at Cargolux.

Lavian at Bedek adds that the A380F will have limited market appeal. “Due to the capacity and range provided by the jumbo, the A380F is supposed to be adopted by airlines based in the Asia Pacific, where these airlines’ geographic positions and possible cargo volumes match the freighter well. So the market for A380F is limited to the incumbents, like FedEx, for the foreseeable future and therefore the freighter will not be an immediate threat to 747-400SF”.

More serious consideration comes from the A380F’s purchase price, and

Cathay Pacific will add to its 747 freighter fleet with six ex-Singapore Airlines 747-400s converted by HAECO. The airline has stated that lead time for converting used 747-400s is shorter than the order and build time for factory built aircraft. Cathay Pacific has confirmed it will use the 747-400SFs for 10-15 years.

consequently the comparison of the investment in the A380F and B747-400SF. The A380F’s list price is \$320 million. Even with the most favourite discount of 30%, the A380F is still too expensive. The purchase price of the aircraft and the consideration of the monthly lease payments or financing charges thereafter, the 747-400SF is much more acceptable for airlines with lower traffic volumes.

Thus, the A380F and 747-400SF will be located in different market segments, although some incumbents may compare the two aircraft when making a purchase decision.

Some industrial people argue that the surge of the -400 conversion project is just because the market is lacking suitable freighters to meet the surging demand at the current stage, and consequently the conversion market will slow down in three years once the market is saturated. As a rule of thumb, however, a new type of aircraft is created to meet the demand and correspondingly the aircraft will change and reshape the market once being produced. The freighter conversion programme for the 747-400s implies an emerging 747-400SF trading market. Once the market is formed, the purchase price and leasing rate for the freighter will be stable and more 747-400s will be attractive to convert.

Conversion cost

For the conversion to a freighter configuration, a 747-400 receives a side cargo door and an internal layout that is identical to the 747-400 freighter. That includes 30 pallets on the main deck and a comparable volume.

The upper deck of the converted freighter is capable of seating up to 19 people, an option found on no other converted freighter. Also included is a strengthened main-deck floor, full main-deck lining, provisions for a new cargo handling system and revised flight-deck systems. Included in the modification work will be the installation of an aft main deck cargo door and strengthened main deck floor beams plus cargo loading and modified environmental control and smoke-detection systems.

So far there are only two companies

Air Canada's 747-400 Combis are thought to be some of the first 747-400s being converted by Bedek. Bedek is the only facility so far with the ability to convert Combis. Bedek is offering the conversion for the 747-400 Combi at a list price of \$11.5-12.5 million.

able to design and perform the conversion; one is Boeing and the other is Bedek.

The Boeing conversion will have an estimated capacity of 250,200lbs, structural payload at a design range of 4,100nm and will be capable of 870,000lbs maximum take-off weight (MTOW). The conversion has a list price of \$25 million, while the kit retails at \$20 million.

Bedek-converted 747-400s will have a MTOW of 875,000lbs, a maximum landing weight of 652,000lbs and a maximum zero-fuel weight of 610,000lbs. Maximum structural payload will be 253,000lbs, about 8,000lbs more than Bedek-converted 747-200SFs. Range with full payload is extended to over 4,000nm, about 1,000nm more than the -200SF.

Bedek's conversion has a price of from \$17-18 million, while the price to convert a 747-400 Combi will be \$11.5-12.5 million. If the conversion is combined with a D check, the customer will save about 50% of cost of a D check. Hence, the total cost of preparing a 747-400SF is no more than \$53 million for an aircraft built in 1991, based on current market values, and converted in Bedek.

It is expected the market lease rate will be about \$600,000 per month. With 747-400's market value dropping, however, the total cost of preparing a 747-400SF for service will decline.

Markets

The profitability of a 747-400SF mainly depends on sector length, aircraft utilisation and load factor. As previously analysed (*see The case for a 747-400 freighter conversion, Aircraft Commerce, August/September 2002, page 42*), the 747-400SF will reach the break-even point with a daily freight volume of 140,000lbs when operated on a 2,500nm sector length and annual utilisation of 3,000 block hours (BH). This changes to a daily freight volume of 136,000lbs when operating on an average sector length and annual utilisation of 3,500BH. The break-even freight volume is even lower at 106,000lbs when operated on a 4,000nm and utilisation of



4,000BH. This analysis further showed that the 747-400SF at a lease rate of \$550,000 per month generates a higher gross profit per trip than the 747-400F with a lease rate of \$900,000 per month. The 747-400SF and -400F will have virtually the same fuel burn and handling costs and identical flight crew costs. Because the -400SF is a mature aircraft it will have higher maintenance costs than a new -400F. The difference will only be in the order of \$200-300 per flight hour, when heavy check and engine reserves and rotatable management and inventory costs are considered for the -400F. This will be an advantage of about \$0.8-1.2 million per year for the -400F, but its \$350,000-450,000 per month higher lease rate puts it at a serious disadvantage.

In practice, airlines in the Asia Pacific have a strong enthusiasm in converted aircraft due to the potential profits generating from cargo business. A key player of the converted freighter is Dragonair. This carrier will have two -400SFs entering service in 2006, two in 2007, and one in 2008, which probably will operate in US routes. "These aircraft are expected to operate at least 15 years while daily utilisation will be 14 to 15 flight hours," says a spokesperson for Dragonair. "Cargo continues to perform well and is now a significant contributor to our bottom-line. We anticipate that there will be a double-digit growth in freight tonnage during 2005".

Cathay Pacific, launch customer of Boeing -400 conversion programme, has recorded strong growth rates in cargo over the past few years. In the first half of 2004, Cathay Pacific's cargo increased 15.8% while load factor of cargo and mail was 68.7% and yield of HK\$1.72.

This carrier has signed a firm order with Boeing for six -400SF conversions, with the first aircraft going into operation in January 2006. Cathay confirms the converted freighter will have life span of about 10-15 years.

JAL's first 747-400SF of seven will operate in 2006. These aircraft are expected to operate on routes to Europe and the US, achieving up to 12 or 13 flight hours (FH) per day. JAL has said its freight capacity will grow 3% per annum in terms of available ton-miles (ATMs) and 3% per annum in tonnage capacity over the next three years.

Japan's Nippon Cargo Airlines has confirmed a deal with Boeing to have four 747-400s converted to freighters. It has also taken options on four more conversions. The converted aircraft will replace older 747 'Classic' freighters and will be in addition to three new-build 747-400Fs ordered recently. The new-build aircraft are due to be delivered in 2005 and 2006, while the first four -400SFs are due for delivery after conversion between 2007 and 2009. If the four options are firmed up as expected, these deliveries will continue until fiscal 2012.

Then, what cargo will these carriers transport? "The cargoes depend on the routes we fly. These days we are shipping components and parts for assembly goods to markets such as the US or Europe. These shipments include consumer electronics, digital goods, spare parts, auto parts and fashion goods. The most important cargoes on routes into Japan are shipments of foodstuffs, including seasonal fruit and vegetable and seafood," a spokesperson for JAL confirms.



Korean Air Cargo, which has ordered 20 747-400SFs, recorded remarkable growth in China, Europe and Southeast Asia routes. With the expansion of China's foreign trade and the export boom of Korean cellular phones, Korean Air Cargo posted annual growth rates of 42%, 23% and 19.3% in 2001, 2002 and 2003. KAL's freighter utilisation increased from 13.1 hours in 2002 to 14.1 hours in 2003.

China obviously is the most important consideration for these carriers to purchase -400SFs. Dragonair makes the point that China is the manufacturing centre of the world, and it is the goods produced by mainland factories and the equipment and parts that they need to operate that is expected to make up a significant amount of the freight it will carry, in addition to general cargo, from the Pearl River Delta and the Yangtze River Delta regions.

However, the airlines intending to adopt the converted aircraft are not limited in Asia Pacific Region. "We are negotiating with some airlines based in Europe and US. We will have several customers to announce in the near future," says Dariush.

Wecker at Cargolux confirms it is examining the possibility of the 747-400SF: "We are considering the -400SF, A380F and 777F. If Boeing is to develop 747 Advanced, we will consider that as well".

Lufthansa Cargo says that it will not consider the -400SF in the near future because it has already planned to simplify its fleet with MD-11s in 2005. The airline has said that it is still open to the possibility of purchasing 747-400s from Lufthansa Airlines and converting them.

Oligarchs

So far only Boeing and Bedek have ability to perform 747-400 conversions, but they have demonstrated different market strategies. In Boeing's model, the company tailors the conversion design for an airline customer, while outsourcing the modification job to a maintenance provider like TAECO or HAECO. Boeing appointed TAECO in January 2004 as the first conversion centre for its new 747-400 Special Freighter programme, with an initial order for 13 aircraft, among which are Cathay Pacific's six -400SF. In September 2004, the contract was expanded to convert 33 aircraft.

Boeing's model implies that those airlines, which has stakes in maintenance companies and adopts Boeing's design, can share the profits generating from the conversion and reduce the conversion cost. This partly explains why Cathay Pacific attended Boeing's conversion programme. Another attraction from Boeing's model is the development and transfer of conversion ability to the airlines. For example, Korean Air's first -400SFs will be converted in other conversion centres while the other 19 -400s are to be converted in KAL's subsidiary, KAL Aerospace.

Boeing's advantage is not limited in these points. "Boeing is forced to do these conversion projects. Because the 777 and A380 have made the 747-400's residual value plummet, the owners of 747-400s put a strong pressure on Boeing. Boeing has to do the conversion projects to enhance these aircraft's residual value," says Rick Hatton, chief executive officer of Cargo Conversions LLC.

"Boeing achieves benefits with its

Korean Air will convert 20 747-400s; most by its subsidiary KAL Aerospace. Boeing's modification differs from Bedek's in that Boeing will sub-contract modifications to third parties, while Bedek will convert aircraft itself. Bedek's list price is about \$7 million than Boeing's.

comprehensive advantage. It persuaded SIA sell these ageing -400SFs at a favourite price while selling 777s or other aircraft to SIA at a low price. At the same time, it offers a package price, including design and modification price, to the -400SF buyers. In this way, Boeing restores the 747-400's residual value and sells other aircraft, while SIA phases out its 747-400 fleet and the -400SF buyer gets a cheap price. Boeing is a broker in these deals," adds Duke.

Although Bedek may seem at a disadvantage, it has its own unique advantage. "Bedek's advantage is that it is the only facility that can convert the 747-400 combi; the first 747-400 being converted in Bedek is a Combi," says Skinner. Boeing is also looking at bringing forward its expected Combi conversion programme soon. It had been anticipated to deliver the first Combi freighter conversions in 2008, but growing demand from Combi operators has led Boeing to believe it may come forward to 2007.

Lavian thinks Bedek has more advantages. "Apart from our price advantage, we have experience and expertise advantage. We have converted 767 passenger aircraft, while our competitor has not done. We design and perform the conversion by ourselves while our competitor only designs".

So far Bedek has not announced any launch customer for its conversion project. "We have signed contracts with two customers, which have two and five -400s to convert in Bedek respectively," says Lavian. The launch customer's name is expected to be announced in a few months, while the first conversion is expected to finish in March 2005. Also, Lavian believed that Bedek would obtain a supplemental type certificate (STC) by the end of 2005. Although the name of Bedek's launch customer is still confidential, Lavian confirms it is an aircraft leasing company. When asked whether this implies that Bedek's customers would be more from aircraft leasing companies, Lavian says there will be some airline customers soon, and emphasises that the business from an aircraft leasing company is evidence of Bedek's conversion quality and price advantage.

A war between the two oligarchs has just begun. **AC**