

Thirty-five years on from the dawn of the express package era, the outlook for narrowbody and widebody freighters is examined in the context of the logistical demands arising from another revolution: the dramatic growth of low-density e-commerce traffic. Andy Coupland investigates the issue.

The advance of e-commerce, and the demand for freighters

The launch of the FedEx network in 1973 heralded the dawn of the express-package revolution. Since then FedEx's 'integrator' model has been deployed on a global scale. Speed is the central principle of the express revolution. Unit revenue yields on cross-border express-package traffic are a multiple of those achieved by conventional air cargo carriers, although total distribution costs are also higher. In 2017 FedEx's annual revenue from express traffic was \$34.8 billion. On average it delivered six million express packages per working day, and used 664 aircraft and more than 90,000 vehicles as part of the infrastructure that delivered packages to customers in 220 countries.

The FedEx model has been replicated and the express sector is now dominated by three giant companies: FedEx, UPS and DHL, now a division of Deutsche Post.

Integrators need large freighter fleets, and the 'Big Three' together operate 57% of the global narrowbody freighter fleet and 50% of the widebody freighter fleet, equating to 52% of the total global freighter fleet. In addition, almost every air freight and combination carrier routinely carries consolidated express traffic on behalf of the integrators.

The economics of the integrators' hub-and-spoke distribution systems have played a major role in shaping and optimising the cost, performance and payload characteristics that define today's global air freighter fleet. The carriers combine ultra-short haul, regional and long-haul intercontinental operations in a time-critical network.

"If you fly only 2-3 hours per day within an integrator hub-and-spoke system, the economics of the aircraft will not work if it is new. This is why narrowbody freighters are all converted

aircraft. There is no factory-built freighter in the A320/737 category, and there never will be, because it doesn't pay," says Wolfgang Schmid, vice president of sales & marketing for Airbus Freighter Conversion EFW. "Equally, you mostly see brand-new freighters for long-haul mainly because of the aircraft's reliability and high utilisation rates. But if you do not fly 10-14 flight hours (FH) a day, buying a new aircraft makes no sense."

The E-commerce revolution

On 11th November 2017, Alibaba, the largest Chinese e-commerce retailer, recorded online sales of \$25.4 billion in a single 24-hour period. This promotional event generated almost a billion packages, including over 30,000 tonnes of high-value seafood and other produce. Although this volume was unprecedented, an average of 100 million parcels per day is now routinely transported by Alibaba's 'Cainiao' logistics platform, with levels projected to reach one billion packages a day within 10 years.

Forty-five years after the express revolution began, 'e-commerce', the mechanism whereby goods (and services) are ordered online and delivered directly to the consumer, is driving another logistical revolution that may have similarly profound implications for the future shape and size of the global air freighter fleet. Worldwide retail e-commerce sales, which eMarketer estimated to be \$1.54 trillion in 2015, are forecast to reach over \$4 trillion by 2020, with a cross-border component of 20%.

Alibaba's vision for global e-commerce is to achieve delivery between any two Chinese cities within 24 hours, and any two global cities within 72 hours. Most such cross-border deliveries achieved within those time criteria will, of

necessity, utilise air transportation as a key link in the logistics chain.

Amazon, the other giant e-commerce retailer, is larger still than Alibaba, with 2017 gross revenues of \$177.6 billion. Other e-commerce groups are also being created to challenge these two dominant players, at least in certain markets.

Implications of the e-commerce revolution for the integrators and freighter aircraft, both converted and new-build, however, are complex.

Although the major integrators, as well as the newer entrants such as SF Express in China, possess the global infrastructure to accommodate the demands of e-commerce, there exists an area of fundamental conflict between the express and the e-commerce business models which may limit the role of the integrators in catering for e-commerce growth. Express charges a premium for speed, while Amazon has set a precedent for low-cost or free shipping. Alibaba has set itself a goal of pushing logistics costs down from the current 15% of total distribution costs to less than 5% for long-haul. The express product is tailored for markets where there is compelling need for time-definite, door-to-door delivery. E-commerce seeks to achieve high market penetration by offering the same service level as express to consumers that may have no compelling need for urgent delivery. As Schmid says. "This does not mean people are prepared to pay a premium for the product, like FedEx and DHL for overnight. People order by mobile, and then offers like Amazon Prime mean they would be happy to get it overnight. Overnight delivery is not the driver; the driver for e-commerce is the method of purchase, but you still need access to a regional freighter network aircraft if you are to achieve overnight delivery in many



markets. This is why you see delivery centres like Amazon's centre next to Leipzig airport where DHL has a major hub. It is an open secret that Amazon is looking to build up its own fleet. Alibaba is part of the same phenomenon, and in China it has the same explosion of e-commerce, which of course influences the demand for freighters. So we see that the future market for freighters may increase considerably, not only for express package but also for e-commerce traffic."

Amazon has begun building its own logistics network to augment capacity provided by others. Amazon is using the capacity of 34 767Fs under various contractual arrangements, and it is widely rumoured to have approached Boeing with a request for 100 767-300ERFs. It has used its dedicated freighter fleet to support the specific needs of its e-commerce business model, such as rebalancing and restocking warehouses.

Alibaba has a minority stake in YTO Cargo Airlines, which only operates narrowbody freighters in China, but has aspirations to operate intercontinental freighter services. It has applied to the Civil Aviation Administration of China (CAAC) to operate flights between Zhengzhou and Tokyo Narita, Shenzhen and Clark in the Philippines, and between Changsha and Ho Chi Minh City. It plans to use 757-200PCFs for these services.

In a parallel e-commerce initiative, Google last year invested \$550 million in JD.com, another Chinese e-commerce retailer, and it is now suggested that JD.com is negotiating with at least one Chinese freighter operator for provision of freighter dedicated services.

Although the integrators' express infrastructure is perfectly suited to the fulfilment of e-commerce transactions,

the same is not necessarily true of their respective cost structures.

In this context, in a 2016 investor call FedEx chief executive officer Fred Smith applauded the rise of e-commerce and foresaw FedEx continuing to be 'a major player in the e-commerce space', but set the importance of this type of traffic to the integrator in perspective by noting that 85% of FedEx's business "has nothing to do with e-commerce".

So while some e-commerce shipments can clearly bear the costs levied by the integrators for express delivery, it is likely many will not. Use of the marginally-costed belly capacity of passenger aircraft is the logical alternative, but at the expense of speed of delivery.

P2F converters' perspectives

"The hot topic is e-commerce, Amazon and Alibaba, and what they are doing to drive demand for narrowbody freighters specific to our business," says Robert Convey, senior vice president, sales and marketing at aircraft passenger-to-freighter (P2F) converter Aeronautical Engineers Inc (AEI). "Despite a lot of noise in the background, I am not seeing a lot of direct demand for narrowbody freighters from those companies. Amazon has been looking at -800s, and I think they are on the verge of making a commitment for a handful of aircraft, which will be operated on their behalf by an airline like Air Transport Services Group (ATSG) or Atlas. I think they are looking at operating those aircraft within the FedEx model, where they bring a package to a place from where their trucks can take it the final mile."

Convey sees this type of initiative involving small numbers of narrowbody

The explosion in e-commerce has started a spurt of growth in freight traffic previously seen with the express package business 35 years ago. A high demand for freighters to provide the required capacity is forecast.

freighters as experimentation within an evolving business model, and has seen that same process taking place in China. He observes that five or 10 aircraft is 'a mere drop of water in a bucket' compared to what would be needed for a comprehensive distribution system. "So although Amazon and Alibaba will try multiple modes of distribution, I think they are decades off having the scale to be able to do that better than the US Postal Service (USPS), FedEx or UPS.

"So from that viewpoint, I do not see a great impact," continues Convey. "Amazon has to dovetail into the existing FedEx/UPS/DHL systems, while Alibaba needs to use SF Express. Alibaba is perhaps obtaining more dedicated lift through companies like YTO even earlier on than Amazon, but that is because there is not a fully-fledged Chinese FedEx-style operation. Even though SF Express is quite evolved, it does not have the penetration in China that UPS/FedEx have in the US."

Mike Andrews, director of conversion programmes at Pemco, another leading narrowbody P2F converter, shares some of Convey's views on the Chinese context. "In 2006 when we stood up the P2F conversions line in China, there were only two or three air operators hauling freight in China. Now there are two major players, SF and YTO, but all these smaller operators working with the larger companies. China is a really complex area. The government has to give permission to open up a new company. It has the potential for a lot of growth, but it will not happen overnight."

Which narrowbody freighters will be favoured in a global market in which e-commerce is a significant consideration?

"All narrowbody freighters certainly have a bright future," says Convey. "The 737-800 P2F in my opinion has the brightest future among all types, replacing 737-200s, -300s, -400s, MD-80s and 727 freighters, as part of the normal replacement cycles of FedEx, UPS and DHL. The 737-800 will be the new standard narrowbody freighter, by 300-500 units, and some will carry e-commerce for sure. E-commerce will add some aircraft to the narrowbody P2F market, but it is not going to change markedly in the next 10 years."

Low density, typically 6.0-7.5lbs/ft³, is a defining characteristic of e-commerce traffic. Narrowbody P2F freighters will be favoured by operators wishing to

GLOBAL INTEGRATOR DEDICATED FREIGHTER FLEETS

	FedEx	UPS	DHL	SF Express	Totals
Narrowbody	146	78	99	40	363
Widebody	262	180	113	5	560
Total	408	258	212 *	45	923

* Estimate

E-COMMERCE RETAILERS DEDICATED FREIGHTER FLEETS

	Amazon	China Postal	YTO	Totals
Narrowbody		32	9	41
Widebody	34	0	0	34
Total	34	32	9	75

profitably accommodate this traffic within their business models (see table, this page). Factors other than average maximum payload density must be taken into account when determining the optimum aircraft type for an operator.

A321

“The A321 is a no-brainer,” says Schmid. “There is definitely a need for it. The 757 has been more than successful as a big narrowbody. The A321 is the perfect successor to the 757, and will have no competition in the short-term. We see that the A321 has more containerised volume than the 757, even though the A321 is smaller. We insist on using containerised volume, because we believe the future of e-commerce will be containerised. It is too risky to use the belly as bulk hold, especially in areas where you have heavy rain and storms.”

EFW emphatically rejects the view of some observers that integrators will not use the bespoke ‘AKH/LD3-45’ ULB which is tailor-made to fit the belly of the A320 family of aircraft. “Critics of the LD3-45 are always operators of Boeing aircraft,” says Schmid. “No container will go in the belly of a Boeing narrowbody, and the doors open inwards. Using containers in the belly of a narrowbody requires a change of mindset, but it means the operator can interline with the whole A320 family of passenger aircraft in the future.”

The prototype A321 P2F will be completed and certificated by EFW by September or October of 2018. The launch customer is Vallair, which has also placed the launch order for the 321 Precision A321 P2F conversion.

“We believe our conversion configuration solution is the best for the A321,” says Schmid. “We have met the

challenge of putting 14 containers on the main deck. Our competition’s 14th position is like our aft position on the A320. We succeeded in finding a solution thanks to access to original Airbus data. This is an advantage of being the subsidiary of an original equipment manufacturer (OEM).”

He confirms that the operating empty weight (OEW) of the converted EFW A321 P2F will probably not be lower than that of the aircraft in passenger configuration. This contrasts to the Precision A321 conversion, which is forecast to be more than 6,000 lbs lighter.

“Despite this, the A321 is still forecast to have a 27-tonne payload. This is a perfect fit in terms of density, so the A321 will offer the best operational costs. On the 757, put the same density in the 757 without using the belly and it will max-out at 24-27 tonnes, despite having 36 tonnes weight payload. So, the A320 family offer a perfect density match for the predominant types of air freight, a bit better even than the A330-300.”

Both the Precision and EFW A321 P2F conversion programmes were evaluated in detail (see *A321F conversion programmes analysis, Aircraft Commerce, February/March 2018, page 56*). While the containerised volume of the Precision conversion is 3.9% less than the EFW conversion (assuming use of an LD3-45 in position 14 on the main deck of the Precision aircraft), the greater structural payload (by a factor of 6-9%) and higher main-deck permissible pallet weights currently envisaged for the Precision conversion, may result in a freighter which offers greater operational flexibility for certain operators.

Speaking from the perspective of the Boeing narrow-body converter AEI, Convey acknowledges that the A321 P2F will have a valid role to play in the future.

“The A321 will be converted, and it will have moderate success in the 757 size category. The 757 still has plenty of feedstock, equal to another five or six years of good aircraft assuming that engines are available, so the A321 P2F is going to have a tough time initially.”

737-900 P2F

As shown in Table 3, a 737-900 P2F - were such a conversion to be offered - would be second only to the A321 in matching its weight payload to e-commerce traffic at typical densities (see table, page 78). So does this make it a candidate for conversion by AEI? “We are looking at the -900 non-ER,” says Convey. “54 of them were built, and we think it would make an interesting freighter. As a fleet, it is approaching 18 years old, so it is entering the zone of conversion. The people who fly it like it, they have found niches for it, but as it gets to 18-20 years old it will find its way out of the fleet. If you can get a critical mass of 15-20, then a DHL/FedEx/UPS will find work for it because it is a higher volume. This would be 12 positions like the 727, but the 737-900 is less weight. We can get 52,000 lbs of freight on an -800, but will get only 47,000 lbs on a -900 because you are carrying extra fuselage weight. This payload should be more than adequate for low-density, e-commerce traffic, however, assuming an average density of 6.0lbs/ft³.

“If we are talking 440 ft³ volume times 6lbs/ft³ packing density, then this will be 2,640lbs in each of 12 pallet positions. This is equal to 36,000lbs at that density of 6lbs/cu ft, when you include the 500lbs for tare weight of each of the containers,” continues Convey. “That screams Amazon, Alibaba, e-commerce. And 1,000-1,500nm is all you need for these types of operations. The feedstock should be fairly reasonable on price as it comes off-lease. Hopefully the conversion would be similar to our -800 in terms of on-ramp cost. So we are looking at it.”

Pemco, the champion thus far of the 737-700 P2F among NG 737s, takes a rather different view of the -900. “737-900? The ER aircraft is very expensive right now. For the straight -900 it raises questions about the attrition rate of the fleet,” says Andrews. “Only 70% of the fleet is likely to be convertible; the others will be scrapped out. We are finding that leasing companies are deciding to part the aircraft out because the engines are worth so much.”

A320

As a potential freighter conversion candidate, the A320 has evoked intense and contradictory opinions within the

P2F sector. “The A320, which EFW intends to certify, is dead on arrival,” claims Convey. “It is a 737-400-size aircraft. It has got technical challenges in getting certified. It is fly-by-wire (FBW), so Boeing operators are going to look at it with cross-eyes. If the 737-800 becomes the standard with 11 full positions, then companies like DHL, FedEx and UPS will issue tenders for third-party lift based on the 737-800 with its 11 positions, since the A320 will only have 10. It does not sound like a big difference, but AEI became successful as the market-leader in the 737-400 because we had 10 positions compared to Pemco’s and Bedek’s nine. It may only be one position, but it is over 10% more volume on every flight. That is a huge deal to any airline, and it will be the same difference between the A320 and the 737-800.”

Convey has further concerns about the recurring, per unit costs of conversion. He draws the conclusion that a viable alternative, like the 737-800 P2F, is going to win every time. “So I do not see a market for the A320 P2F. I may be wrong -- maybe a Chinese company will buy 100 -- but I do not see the A320 P2F being a threat to the 737-800.”

Andrews has similar feelings. “Of course the A321 will be converted, but I do not think the A320 will hurt the 737-800. In fact I do not think the A320 P2F will take off. I may be wrong, but it is really difficult to mix fleets. It is hard to

throw an Airbus into a Boeing fleet. A freighter operator does not want to mix containers, much less mix aircraft types.”

Schmid counters with several points. “The A320 P2F will definitely not be dead-on-arrival! There are challenges, such as the re-siting of the angle-of-attack sensors. But as a direct consequence of the work that created 14 full positions on the main deck of the A321 P2F, we had a solution for the A320 for 11 positions, 10 plus one on the main deck, plus seven in the belly. So all of a sudden the A320 is above the 737-800 P2F for containerised volume.”

Schmid concedes, however, that the A320 conversion itself will be expensive on a unit-by-unit basis. “It is more expensive than we originally expected, but we are going ahead with it because the on-ramp price will still be better than a 737-800. This is because of the relatively low cost of A320 feedstock. We have the advantage because we are related to Airbus. We have internal data, and know how to move the AoA sensors.

“Every 737 P2F operator is a potential A320P2F customer,” continues Schmid. “The bad news is that all of them already have 737s, and we are pretty late with this programme. We are, therefore, number two in the fight, and why move to a product that is very similar, but based on a different type of aircraft? So we need the A321 first to enter the market. The A320 will have a

standalone market, but only for airlines that do not already have 737s.”

Schmid notes that the situation will be entirely different for an airline already flying A320s as passenger aircraft, and that a P2F will confer a second life for lessors already in possession of A320s.

737-800

AEI will soon deliver the first 737-800SE, following completion of flight testing and granting of the supplemental type certificate (STC). Convey says that no significant challenges have been encountered or are anticipated. But is the 737-800 feedstock prohibitively expensive for a P2F conversion that will typically fly only a few hours each day?

“If an independent operator buys a \$15 million aircraft and spends \$5 million on conversion and maintenance combined, you have a \$20 million asset,” says Convey. “That means the lease rate today is going to be \$200,000-220,000 per month, compared to \$130,000 per month for a -400, and you get one more position out of the -800. The business case for the -800 depends on aircraft utilisation, and on the value of your freight. But as the leading 737-400 conversion provider, I am seeing a dramatic slowing of available feedstock.”

To understand market behaviour at this point it is necessary to recognise the different criteria that will be applied by a

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NARROWBODY FREIGHTERS CONTAINERISED VOLUME & PAYLOAD

Aircraft type	Converter	Containerised volume - cu ft	Net payload lbs	Max packing density - lbs/cu ft
A321-200P2F	EFW	7,610	54,346	7.14
737-900SF	AEI **	5,468	40,868	7.47
A320-200P2F	EFW	5,603	43,170	7.70
A321-200PCF	Precision	7,299	58,308	7.99
737-400SF	AEI	4,572	41,386	9.05
737-800SF	AEI	5,012	46,379	9.25
737-300SF	AEI	3,860	38,412	9.95
737-700F	Pemco	3,844	40,401	10.51
757-200PCF	Precision	6,570	76,335	11.62

* Gross structural payload less tare weight of typical container configuration

** Illustrative values ? design study only

WIDEBODY FREIGHTERS CONTAINERISED VOLUME & PAYLOAD

Aircraft type	Converter	Containerised volume - cu ft	Net payload lbs	Max packing density - lbs/cu ft
A330-300P2F	EFW	18,581	118,603	6.38
767-200BDSF	Bedek Aviation	12,604	83,217	6.60
767-300BDSF	Bedek Aviation	15,604	112,776	7.23
777-300ER P2F **	Bedek Aviation	28,139	204,567	7.27
A300-600F	Airbus	13,208	96,100	7.28
A330-200P2F	EFW	16,016	118,598	7.40
777-200ER P2F **	Bedek Aviation	21,771	171,918	7.90
A380 P2F	N/A	37,870	301,636	7.97
A330-200F	Airbus	16,016	138,398	8.64
747-8F	Boeing	30,312	274,587	9.06
MD-11F	Boeing	20,539	186,527	9.08
777-200F	Boeing	21,771	212,118	9.75

* Gross structural payload less tare weight of typical container configuration

** Illustrative values ? design study only

lessor, as distinct from an airline operator. “A lessor that looks at the -400 as a long-term investment is not going to look at a 1990/91 aircraft, even if it has low cycles, because it wants to have the asset perform for another 10-15 years. Lessors are starting to shy away from most 737-400s unless they are 1997/98 vintage.

“An airline will take a different approach. Airlines that own their fleets are going to keep the aircraft forever. They see it as a tool to use, not as an investment vehicle, although they are becoming more picky because requirements to maintain the aircraft are becoming tough. So the -800 is coming along quicker than I imagined. I think it will be 2020/21 before we get the price right, but with -400s drying up quicker than I thought, people are being pushed into the -800.”

737-700 P2F

The 737-700 is now offered as a P2F conversion by Pemco and IAI/Bedek. Given that the -700's shorter fuselage accommodates one fewer main deck

position than the 737-800, while only offering marginal reductions in operating cost, is there a niche for the 737-700 in a market place increasingly driven by the demands of low-density freight?

“We see the -700 going down the same path as the -300/-400,” says Andrews. “Everybody thought that when the -400P2F came out that the -300s would die out, but that was not the case. Our -400s came out in 2006, but the -300s kept going. In terms of positions, you lose 5,000lbs. That's \$5,000. You will not overcome that through reduced operating costs. But between the -700 and -800 feedstock, you are looking at a \$5 million split between the two aircraft right now. It takes a lot of freight to overcome that \$5 million dollar higher asset cost. So the -800 looks attractive because of the capacity, but in China some of them are flying as low as 70% capacity. So if you are flying a -300 at 70%, look what you would be flying a -400 or -800 at.” Andrews concedes, however, that their high volumes make the 737-800 class freighters attractive for the integrators.

Forecast for P2F conversions

The consensus of those conversion organisations surveyed in the preparation of this article is that they anticipate only modest growth in output of converted freighters in the foreseeable future, despite the apparent stimulus of e-commerce.

Schmid predicts 19/20 narrowbody conversions per year for EFW. “We have four facilities that can do the job, but it is too early to plan,” he says. “Maybe a potential build-up for a fleet like Amazon will change the picture, but only for a short period of time. We have to be conservative; we are not like a large OEM. The major driver for me is feedstock, and it is now a bit more comfortable, as A330s, A321 and A320s are available in bigger numbers.”

AEI delivered 27 freighter conversions to lessors and operator customers in 2017: 21 737-400SFs, four MD-83SFs, one MD-82SF, and one CRJ200 SF freighter. “We expect 2018 deliveries to be comparable to 2017, with 12 aircraft currently undergoing conversion and an existing total backlog of 23 aircraft scheduled for delivery in 2018”, says Convey. The 737-400SF again represents the majority of freighter conversions scheduled for 2018, but there will be more deliveries for the CRJ200 SF as the company has seven aircraft scheduled for completion this year. Additionally, in 2018 AEI will certify the new 737-800SF freighter conversion, for which the company already has over 100 firm orders and commitments.

“At Pemco we target 16 per year,” says Andrews. “The reason we keep our target low is that we want to maintain quality, and 16 a year is all we can handle. We are seeing a decline right now in feedstock, especially for -300s and -400s. Demand for the conversions is still high, especially from Europe, South Africa, Brazil and China. Airlines are looking for aircraft below 20 years of age, with a good pedigree, bought new by a credible operator that keeps them until they are retired.”

As for Bedek Aviation, it delivered 18 767s and 18 737s conversions in 2017. “That is a very large number”, commented Rafi Matalon, business development director at Bedek Aviation.

New P2F programmes

Responses from P2F converters surveyed for this article suggest new P2F programmes may emerge in the near future. “We would like to focus on an A321 P2F,” says Matalon. “The A321 will have the best performance of the A320 family as a converted freighter, but we are still not at an advanced stage with the Airbus family.”

But can Bedek overcome the technical challenges associated with converting the Airbus narrowbodies? “We have expertise to convert that no OEM has,” says Matalon. “I have full respect for the OEMs, but we are experts in making such a major modification that involves cutting an aircraft. We are developing our STCs as an OEM.” Bedek expresses no desire to convert the A320. “The A320 has the same performance as the -700 and -800,” adds Matalon, and so offers no competitive advantage in his opinion.

As to the status of Bedek’s 737-800 P2F programme, Matalon comments “We will have the STC very soon. We are reinforcing the floor beams and systems, and expect to have the STC in one or two months. Our remote site in Mexico is set up to cater for demand.”

Andrews confirms that Pemco is definitely going to develop and certify an STC for a P2F conversion of the 737-800. “It is already in our plan, and we are doing some work. ATSG bought Pemco in 2017, so it is one of our drivers in getting the -800 freighter online.”

Widebody freighters

The impact of e-commerce on the widebody freighter market is already being felt through the initiatives of Amazon and other online retailers as they seek offer all the benefits of domestic e-commerce logistics in respect of speed of delivery and price over regional and intercontinental sectors. Yet logistical challenges become significantly greater over such distances, along with the scale and cost of requisite infrastructure. So what is the likely impact of the growth of e-commerce traffic on the medium- and large-widebody sector?

“It is a complex question,” Schmid maintains. “It is definitely much more cost-intensive on long-haul flights. This is why you see factory-built freighters doing that job. EFW does not have anything to offer in this long-range market sector. Airbus is considering an A330-900F, and maybe even an A350 freighter, but this is a totally different market to that of the conversions. Even if an A330-900 has the same fuselage, more like a A330-300, it would perform a totally different mission. It would have a long range, and a bit more payload than our regional A330s as a converted freighter.”

Yet if the feedstock for an A330-300 P2F was certified to a high-gross weight, such as 235 tonnes maximum take-off weight (MTOW), it would still be capable of flying more than 4,000nm with a full payload. “Agreed, but the A330-300’s major mission from the market demand today will be regional,” adds Schmid. “It will start with regional demand, but that does not mean an operator will not use it for longer-range



missions. This is what DHL does.”

EFW does not know what the projected payload of an A330-900F freighter would be, but expectation is that it would be similar to the case of the A330-200F factory-built freighter relative to the A330-200 P2F, where the -200F has some tonnes of extra payload. “You will get some benefit by default with a factory-built aircraft,” continues Schmid. “You do not have to plug the windows. There is just less material around the aircraft which translates directly into payload. So you may have five, six or even eight tonnes more payload on the aircraft, which gives you the capability for a bit more density on the aircraft.”

The A330-300P2F offers 18,581 ft³ of containerised volume, which equates to an average commercial payload density of only just over 6 lbs/ft³, a fact that Schmid welcomes. “As a P2F, it is perfectly fitting now in the new e-commerce market. Years ago, when everyone was looking only for weight payload, it would have been a disastrous aircraft, and nobody would have bought it. We are at 60-62 tonnes payload, and that is good for today in terms of density - we believe we can cater for more than 90% of all traffic. Ten years ago people would have told us that this weight payload does not work for so much volume. Density has dropped dramatically with e-commerce, and this is why we promote volume.”

With respect to market positioning of the A330-300 P2F versus the A330-900F, would the -900F be purchased new and operated by integrators, with the A330-300 P2F as an e-commerce aircraft to be operated regionally?

“The -900F would be a long-range aircraft with really high utilisation,” says Schmid. “If you do not fly 10-14 hours a

day you will never buy a new aircraft. Some people ask me if I fear the A330-900F as a competitor. In fact, I would welcome it. If the A330-900F were to be offered as a new-build freighter for the first time as Airbus we could offer the whole range of freighter aircraft.”

Competition for the A330?

The question of whether EFW will face any competition in offering P2F conversions of the A330-300 elicited a clear response from Matalon. “The A330-300 P2F is a possibility for Bedek. We would like to head to the -300. We focused on Boeings because of the price and availability of feedstock. There is no point in investing in an STC when the feedstock is expensive.” A330-300 P2F feedstock is now seen as plentiful, and at prices low enough to justify consideration of a P2F STC.

767-200

In view of the age of the feedstock, it may at first seem odd that Bedek Aviation is still converting 767-200s into freighters, given that the youngest aircraft of this subtype is now 17 years old. “The explanation for continued conversions is very simple,” says Matalon. “The volume of demand created by e-commerce is now high. The 767-300 is preferable to the -200 as P2F feedstock, because the volume is greater. Unfortunately, the market for 767-300 feedstock is very bad. The moment that a 767-300 is available for conversion, it is taken for Amazon, which is ATG and Atlas. So there is a lot of demand for P2Fs for smaller and medium-sized operators and leasing companies, but unfortunately limited



feedstock is a big issue. So they revert to plan B, which is to use the 767-200.”

Matalon is adamant that the age of the airframe is, at best, of secondary importance when considering 767 P2F conversions. “It does not matter to us if the age will be 20, or 30, or 40 years. There is no impact on the conversion. If you have good engines, the age of the aircraft does not matter. If you check the Amazon fleet, you will find that most of the aircraft are 767-200 P2Fs. If Amazon can allow them to use -200s, why cannot other airlines?”

Matalon sees 100-150 767 airframes as potential feedstock. He does not foresee competition from another emergent converter for the 767-200, for which Bedek holds the only P2F STC.

777-200 P2F

The provisional characteristics of P2F conversions of high gross weight variants of the 777 airframe as potential P2F feedstock were examined in some detail using illustrative Bedek Aviation design weights in *see Assessing suitable replacements for the MD-11F and 747F, Aircraft Commerce, April/May 2018, page 62*). The suitability of the 777-200ER and -300ER for carriage of low-density, e-commerce traffic was noted.

Matalon confirms that the programme remains important to Bedek. “The 777 P2F is our future programme, both -200ER and -300ER. We are ready to start, but we have yet to make a formal commitment to proceed. We think the 777 P2F is an excellent solution as a widebody freighter as the next step up from the 767 and A330. The 777-200ER P2F can be a good solution for e-commerce because the design weights are

limited compared to the 777-200F. The 777-300ER has better capacity, and the weights are close to the factory freighter.

“We are not deterred by the complexity of a 777 P2F,” continues Matalon. “We have past experience on the 747. This is Bedek’s big advantage, since we develop the STCs ourselves. We believe we can increase the maximum zero fuel weight of a 777 P2F, as we did with the 747 and 767. That will benefit the customer, because for one-third of the cost of the production freighter they can buy the 777-300ER with almost the same payload and more volume. Is it economic to spend \$100 million more just to gain another 10,000lbs? I do not think so.”

Aircraft Commerce estimated that the maximum payload-range of a 777-300ER P2F with the weights indicated by Bedek would be 4,350nm, but Bedek’s own work suggests a figure of 4,700nm may be achievable. Matalon confirmed Bedek will not consider a P2F STC for the 777-200LR, in view of the small fleet size.

In a recent development concerning the 777 P2F, it is understood that Boeing is again considering a Boeing Converted Freighter (BCF) P2F programme for the 777. While previously the -200ER was the subject of a Boeing market study, now the 777-300ER is being evaluated instead against the backdrop of rising demand for cost-effective, low-density freighter capacity in the context of e-commerce traffic growth, a role for which a 777-300ER BCF could be ideally suited. This initiative could also address concerns about the limited aftermarket for the 777-300ER in passenger configuration. A P2F conversion programme would also remove 777-300ERs which could otherwise prejudice the attractiveness of new-build 777-8s and -9s.

Demand for 737-800Fs is forecast to be high, given its freight capacity and packing density characteristics.

Schmid cautions on the 777 versus the A330. The A330-300 has only one fewer container on the upper deck and there is no difference on the lower deck compared to the 777-200ER. The 777 P2F price difference, however, would be enormous. In Schmid’s opinion an on-ramp cost of \$50 million or more would not be viable for prospective operators.

Typical 777P2F operator?

IAI’s perspective on the profile of a typical 777-200ER P2F customer is clear. “I do not think about integrators,” says Matalon. “The first group we are marketing to are operators that already own and operate both passenger and cargo aircraft. These are major airlines, with a general cargo and e-commerce business that they would like to increase. They have the feedstock themselves, and so will go for 777 conversions.”

To remain competitive, a passenger carrier must operate an aircraft with a high-quality interior. “They cannot keep the 777 for more than 20 years, and the book value may be higher than the market price they will get. It is, therefore, straightforward to convert it, and they already have the cargo,” says Matalon. “The second group is lessors or investors. The lessors are the same. They have to decide what they do with the aircraft. They can tear it down to components, or convert it and lease it out.”

A380 P2F

The potential for an A380 P2F to provide long-haul lift at e-commerce densities has also been outlined (*see Assessing suitable replacements for the MD-11F and 747F, Aircraft Commerce, April/May 2018, page 62*). So is an A380 P2F a conversion that EFW might consider? Schmid is cautious. “I am not quite sure that A380 P2F is reasonable. Nobody has even a rough idea of the cost of converting this huge aircraft. You have to modify the deck height, which means it is a huge conversion effort.” Estimates of upwards of \$45 million for the conversion cost alone have been cited by industry observers, which would result in an on-ramp cost which might be judged to be excessive by potential operators. **AC**

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