

Large narrowbody freighters with a payload of 25-35 tonnes include the 727F, 757F and A321F, and booming eCommerce sales and high freight yields are making these aircraft highly sought after by carriers and lessors. Yet what is the future demand for these types?

Supply and demand: the requirement for 25-35 tonne freighters

In its Commercial Market Outlook (CMO), Boeing predicts that by 2040 the dedicated freighter fleet will be 3,260 units, of which 2,430 will have been to the fleet over the next 19 years. In its 2021 Global Market Forecast (GMF), Airbus has published a requirement for 2,440 new dedicated freighters by 2040, and speculates that 1,560 of these will be passenger to freighter (P-to-F) conversions of all types.

Large narrowbody (LNB) freighters are those in the 25-35-ton payload category. They are best suited to inter-regional carriers operating high-density cargo routes and requiring larger volumetric capacity than a 737-400/800F, yet with lower operating costs than a medium widebody (MWB) freighter.

In October 2021 the total jet freighter fleet stood at 2,030 aircraft, and the number of LNB freighters capable of a 25-35-ton payload totalled 361 units or 18% of the fleet. Traditional routes for LNB freighters are typically well established and have developed over time, yet high demand for express cargo capacity is providing the impetus for carriers to increase volumetric payload and upgauge available capacity.

Observers of the current cargo-conversion sector claim that the pandemic has spawned a 'golden era' for suppliers of P-to-F conversion programmes driven by eCommerce and low utilisation of passenger aircraft. Questions about the sustainability of converting large numbers of freighters, however, and the future market demand for LNB freighters remain.

Large narrowbodies

The three main LNB freighter types that can achieve a typical gross payload of 25-35 tonnes include the 727-200F (35), A321-200F (6) and 757-200F (320). This is a total of 351 aircraft in service in October 2021, according to the Cirium fleet database.

The last 727-200 was built in 1983 so it is no longer economically viable for a new conversion, and Boeing withdrew its 757-package freighter (PF) offering in 1999. This means all further new 757-200Fs are P-to-F conversions.

To date, Precision Conversions is the only remaining supplier of a 757-200F conversion, with its 757-200PCF sub-type. However, its subsidiary 321 Precision Conversions has developed a conversion supplemental type certificate (STC) for the A321-200PCF as part of a joint venture (JV) with Air Transport Services Group (ATSG).

According to Zach Young, director of sales at Precision Conversions, the resilient secondary market is partly influencing demand for 757-200PCFs from existing operators of the type and several start-up carriers. Astral Aviation recently announced it will be adding three previously converted 757-200PCFs to its air operator certificate (AOC) that includes the 727-200F, 747-400F, 767-200F and DC9-30F aircraft. "Once 757 freighters (or any specific type) are added to a fleet inventory, there is always a strong possibility that the operator will want to convert more of the same type in the future to meet growth," adds Young.

First re-delivered in 2020, the A321-200F is the most recent addition to this category, so it is expected to remain in service for a significant number of years. In October 2021 A321-200F P-to-F STCs were available through Elbe Flugzeugwerke (EFW) with its A321-200P2F, and 321 Precision Conversions with its A321-200PCF. Suppliers Sine Draco and C Cubed Aerospace are expecting to receive type approval for their A321 conversion programmes in 2022, with their respective A321-200SDF and A321-200CCF sub-types.

According to Christopher Stafford, senior director of sales and marketing at Sine Draco Aviation Technology Ltd, the

A321-200SDF STC will be granted Federal Aviation Administration (FAA) approval in the third quarter (Q3) of 2022. Stafford has also announced the induction of its prototype A321-200 for conversion at Ascent Aviation Services in Tucson, Arizona (*See Prototype A321 starts conversion, Aircraft Commerce, August/September 2021, page 42*).

"C Cubed is developing conversion STCs for both the A320-200 and A321-200 platforms," clarifies Brian Sagi, managing director at C Cubed. "We expect the A320-200CCF to be granted its STC in the middle of 2022, and the A321-200CCF later that year. We have tremendous demand for both, and are filling our order books year-on-year (YoY)."

To meet growing freight demand and booming eCommerce sales there will be a requirement for a number of new freighters to maintain equilibrium between capacity and demand.

"In terms of the current requirements in the airfreight market, we are probably undersupplied at the moment, with not enough capacity to meet the current demand, especially given the dynamics of increased cargo demand in the Covid environment," explains Adam Guthorn, managing director at Alton Aviation Consultancy.

Freighter conversion providers are beginning to ramp up output with additional conversion lines, yet it is possible that it will take time for new A321-200F programmes to reach a critical mass. Despite a recent resurgence in demand, the 757-200 P-to-F programme is nearing its end, and the youngest possible conversion candidates are 16 years old.

Talking about the A321-200P2F, Thomas Centner, director of sales and technical marketing at EFW explains: "I believe the high demand is equally split between operators and investors. A number of large leasing companies have been quick in reacting and have been filling

The A321-200P2F has a payload of up to 28 tonnes, and is part of a joint venture between Airbus, ST Engineering and EFW. Links with Airbus mean many consider the A321-200P2F to be an OEM option. To date the sub-type is in service with Amerijet, European Air Transport, Express Freighters Australia and Titan Airways.

our order books rapidly. The leasing companies typically book a large number of slots at once, while some operators are trying to get the earliest available slot. We are trying to bring both parties together to create a win-win situation for all customers.”

It has been suggested that the retirement of older aircraft could accelerate because of the demand for newer types that support industry decarbonisation objectives, and to help achieve net-zero carbon emissions by 2050, with BBAM citing the A320/A321P2F's ‘green’ credentials as one of the reasons for investing into the programme.

“A large number of 757 cargo missions can be operated by an A321, partly because the A321 has about 95% of the 757's total volumetric capacity, and a lower fuel burn,” adds Young. “The 757 is a proven workhorse with unmatched performance. It will continue to serve niche markets and challenging routes for many years to come. However, the reduced carbon footprint of the A321 is becoming more important so we will see A321s start to assume some of those roles.”

Typical monthly lease rates for the 737-800F are \$200,000-\$234,000, compared to A321-200F lease rates of \$245,000-\$275,000, and 757-200F lease rates of \$205,000-\$240,000. Yet both the A321-200F and the 757-200F have greater gross and volumetric payloads.

Retirement rate

Airbus says that by 2040 there will be a need to replace 73.4% or 1,490 of all dedicated jetliner freighters out of 2,030 that were in service at the start of 2020. Assuming this retirement rate, this means 264 LNB freighters will be withdrawn from service, and 97 will still be in service.

In its 2020 World Air Cargo Forecast (WACF), Boeing says that 59% of the freighters in service in 2019 will need to be replaced by 2040. This retirement rate equates to 213 aircraft in this segment being parked, and 148 remaining in service.

In October 2021, 98.3% of the 25-35-ton freighter fleet comprised Boeing aircraft, but diminishing 757-200 feedstock will eventually result in a shift towards Airbus and more A321-200Fs in future. A lower retirement rate would mean that a larger portion of 757-200Fs will remain in



service, while a higher retirement rate will increase the bias towards the A321-200Fs in 2040.

It is credible that the legacy types and older MSNs will be the first aircraft withdrawn from service, assuming that 213-264 dedicated large narrowbody freighters could be retired by 2040.

The 727-200F is in decline and by 2040 the youngest aircraft currently in service will be 54 years old. “727-200F fleet numbers will continue to fall and nearly all of them will be retired by the end of this decade. None will remain by 2040,” explains Alton.

The 727F can be configured to include 12 main-deck 88-inch X 125-inch pallet positions and can achieve maximum gross payload up to 29 tons. There are 727Fs in service in Latin America (14), Africa (10), North America (10) and Europe (1). Operators of the 727-200F include Serve Air (5), Kallitta Charters II (4), Aerosucre Colombia (3) and Astral Aviation (2).

In the near term the 727-200F provides cheap lift to its operators and it will be difficult to replace in terms of capability at a low economic cost. Operators of larger 727-200F fleets are replacing retirees with a number of aircraft types that include 757-200Fs, 737-800Fs and 737-400Fs.

Deducting the whole 727-200F fleet (35 aircraft) from this category will mean that 179-230 other aircraft types in this segment will be retired by 2040, depending on the forecast used. It is likely that many of these will be older 757-200Fs.

In November 2021 there were 320 757 freighters in service, and 18 in storage. The youngest aircraft is 17.1 years of age, and the oldest is 38.7 years old. Of this total, 115 aircraft (36%) are more than 30 years of age, 92 are based in North America, 12 in Europe, and seven are in the Asia Pacific

region. Operators include FedEx (58), UPS (25), DHL Air UK (6) and Cargojet Airways (6).

There are another 137 aircraft (43%) that are 25-30 years old, based in North America (85), Asia Pacific (35) and Europe (17).

There are another 70 aircraft (22%) that are 20-25 years old. Operators include UPS Airlines (15), FedEx (13), DHL Air UK (12) and SF Airlines (11).

All the 757-200 freighters less than 20 years old (12) are Precision (PCF) cargo conversions.

“Sooner or later a large number of 757s will need to be retired from the market because of their age. I think retirements will be exacerbated if there is a big enough number of replacement A321-200P2Fs in the market. Current high demand for capacity is slowing 757 retirements down at the moment, and carriers are using all of their assets as much as possible,” explains Centner.

The total number of 757-200Fs over 25 years totals 252 units, and accounts for 79% of the entire fleet. It is likely that most of the forecast retirements will be included in this category.

In 2021 the UPS Airlines 757-200F fleet totalled 69 units, 55 of which were more than 25 years old. It is possible that the airline could withdraw the type in its entirety after a significant number reach retirement age. Likewise, FedEx operates a fleet of 105 757-200SFs, of which 95 (90%) are more than 25 years old.

On the basis that these forecasts are accurate, it is possible that 90-141 of the existing 757-200F fleet will still be in service by 2040. It is also possible, however, that by 2040 a small number of A321-200Fs could have been included in the retirements during the 19-year interim.



The first A321-200 was delivered in 1995, and in October 2021 the A321-200F fleet included aircraft built in 1998-2000. Due to the relationship between an aircraft's age and its useful economic service life, it is unlikely that future conversions will be based on MSNs built before 1999.

Over the next two decades, it is possible that some of the A321-200F fleet built on older MSNs will have reached retirement age and will be withdrawn from service.

Demand for cargo

An Alton Consultancy report that includes 737-300/400-800 types and LNB freighters, expects the number to grow to 1,100 over the next five years and to 1,250 over the next 10 years.

"Right now there is a boom in narrowbody conversions, but this will level off within five years. Output for P-to-F in this segment will be double that in 2019 and 2020. This will continue for a number of years," says Guthorn.

The 2021 CMO shows that through to June 2021, air cargo traffic had surpassed 2019 levels by 11% and 2020 levels by 24%.

Air freight volumes remain strong and YoY growth in July 2021 increased by 33%, as demand has surged across sectors such as hi-tech, automotive and pharma. According to narrowbody operators, the fallout of widebody belly capacity in the transcontinental freight sector has had little influence in the regional express freight business. Much of the contribution to robust airfreight demand in the narrowbody freight sector is attributed to eCommerce growth.

In 2020 retail eCommerce sales

amounted to \$4.3 billion, and are forecast to increase by 32% to \$6.4 billion by 2024. According to consumer reports 9% of US consumers, 8% of Japanese consumers, and 15% of UK consumers said that they had never purchased anything online before March 2020 and the health crisis. It is likely that new eCommerce consumers are 'here to stay', as US consumers spent \$78 billion online in March 2021; a YoY uptick of 49% and the highest level of growth since July 2020.

"There is an overabundance of demand. eCommerce is huge and it is driving growth in integrated express operations such as DHL, UPS, FedEx and SF Express," says Mark Diamond, vice president at Strategic Aviation Solutions International (SASI). "Most new narrowbody freighter conversions are going into service with integrators, or operators flying on their behalf or on behalf of postal services. For example, Qantas is operating the first A321-200P2F that entered service on behalf of Australia Post."

Another factor is the emergence of a growing number of e-retailer 'own-controlled' operations. "The Amazon 737-800 freighter fleet is growing and is complementing its 767-300F operations," adds Diamond.

JD Logistics, part of the Chinese e-retailer JD.com, has recently announced that it will operate a freighter fleet of 100 units by 2030, and Cainiao, the logistics arm of e-retailer Alibaba, has acquired a 15% stake in Air China Cargo.

According to Diamond, e-retailers can better plan and stabilise their operation and delivery schedules by controlling freight capacity. Doing so will help to mitigate supply chain disruptions during the pandemic.

The A321-200PCF can have up to 15 main-deck cargo positions that include 13 AAA/AY 88 x 125 positions and two AKH/LD3-45 containers. Other options include 13 AAA/AY containers and a PAG pallet in position 14 with a 71-inch allowable height. To date the sub-type is in service with Smart Lynx and soon Global Crossing Airlines.

For the first quarter of 2021 US eCommerce sales grew by 39% YoY, to \$199 billion, and are forecast to top \$1 trillion in 2022. Much of this demand is driven by a universal increase in middle-class citizens with more disposable income, as well as increased consumer willingness to buy online instead of in brick-and-mortar stores during the pandemic.

The Latvia-based airline SmartLynx has reported a dramatic increase in market interest for the A321-200F. "SmartLynx plans to increase its fleet of A321-200Fs to eight by the end of 2022," says Diamond. "It already has two A321-200Fs in its fleet operating on behalf of DHL, and is expecting the redelivery of two 321 Precision Conversions aircraft early in 2022. Lessor BBAM recently announced an EFW order totalling 20 A320/A321P2F conversions to be redelivered through to 2025."

Global Crossing Airlines is planning to lease 10 A321-200Fs from Vallair by Q2 2023, including at least two A321-200PCF and five A321-200P2F sub-types.

There has also been an uptick in interest in freighters among passenger carriers. Almost every passenger airline has some form of cargo operation. Over the years there has been an ebb and flow of passenger carriers introducing and retiring freighters, but in the last two decades many passenger carriers divested freighters from their fleets as the cargo-carrying capability of passenger widebodies grew.

That is now changing, with a number of passenger airlines considering adding freighters to their fleets. During the pandemic, the decline in passenger traffic demand substantially reduced belly capacity from parked passenger aircraft, and soaring cargo demand and the resulting high freight yields have led a number of passenger airlines to decide to acquire freighters.

"IndiGo is acquiring four A321-200s and plans to convert them to freighters. This makes a lot of sense because it already operates A320 and A321 passenger aircraft. The airline noticed an opportunity in cargo and found a way to redeploy its pilots and generate additional revenue in the process," explains Diamond.

According to Centner there is a strong demand in the India express market for LNB freighters to be used as feeder aircraft between the country's major freight hubs.

In 2022 the Lufthansa Group is

Precision Aircraft Solutions has a legacy of converting large numbers of 757-200s. It is now the only supplier of P-to-F conversions for the type. 16 years after the first 757-200PCF entered service, to date Precision Aircraft Solutions modified 19 aircraft in 2021, and has 15 scheduled for conversion in 2022.

planning to add two A321-200P2Fs with Lufthansa CityLine to operate short-haul regional routes under the Lufthansa Cargo brand. The traditional long-range cargo operator is considering growing its narrowbody freighter fleet to four A321-200P2Fs.

Orders for P-to-F conversions in this category are not exclusive to the A321-200F. Precision Conversions redelivered 19 757-200PCFs in 2021, and currently has 15 conversions scheduled for 2022. YTO Cargo Airlines has announced plans to acquire and convert seven 757-200s.

757-200PCF

To date, Precision's 757 conversion capacity is booked until the end of 2023, and according to Young 'three years ago' it was thought that high demand for 757 cargo conversions would have waned. In response to the current high demand, Precision is expanding its cargo door and conversion kit manufacturing capability and its supplier and vendor base.

"Historically the 757-200PCF programme had not been booked more than six to nine months in advance," says Young. "At any given time, we have had multiple conversion lines, and while some of those have in the past been steadily full, if a new customer came to us, we would always be able to find a conversion spot for them. That is just not the case anymore."

A two-year lead time makes it difficult to foresee how demand will hold up post-2023, and if 757 speculators are going to continue buying conversion slots that far into the future. Yet it is believed that if passenger volumes were at 2019 levels there would still not be enough capacity to satisfy the current demand for airfreight.

The 757-200PCF's ability to carry 15 AAA/AAY containers on its main deck gives it a containerised freight capacity of 6,570 cu.ft. The addition of 1,790 cu.ft. bulk stowage in its lower hold, equates to a total volumetric payload of 8,390 cu.ft., and in part it is this large payload and long-range capability that makes the freighter attractive to operators.

"We expect Precision Conversions to complete its 150th 757-200PCF redelivery in Q1 2022, and see potential to secure a total of 187 in the near term. Beyond that there will be a trickle of new conversions until we reach 200," explains Young. "Based on what I see today, there could be 50 more 757-200PCF conversions."



Current demand for LNB conversions is in-part driven by a shortage of suitable 767-300ER feedstock. The payload characteristics, operating economics, and initial acquisition values mean 767-300ER feedstock is quickly acquired by integrators and operators for cargo conversion.

There is no ideal replacement for the 767-300F once feedstock is depleted, and it is possible that not all operators will be prepared to make the jump to the larger A330-200/300F. The most suitable alternative for those operators will be the 757-200F and the A321-200F.

It has been reported that DHL Express has just placed an order for nine 767-300 Boeing Converted Freighters (BCF) - its largest order to date for the aircraft type. Air Transport Services Group Inc (ATSG) recently ordered four BCF aircraft. It is the largest operator of the type and has a fleet of more than 90 converted 767 aircraft.

Operating a fleet of seven 767-300 freighters, Amerijet International Airlines plans to increase its available lift by adding six 757-200PCFs to its fleet.

"It is extremely difficult, if not impossible, to acquire a 767-300ER for conversion within a reasonable period of time. I think this is partly why demand for the 757-200PCF continues to be high," explains Young. "We are confident that demand for the 757-200PCF will remain high, eventually tapering off in late 2024/2025. By then we expect to be converting three to four aircraft per year until the programme ends. Since the last 757 rolled off the production line in 2005, this means even the youngest example will be more than 20 years old by then. Older airframes remain structurally sound but age restrictions in various regions of the world are already becoming a challenge."

The 757 does have a loyal operator

base and until the end of the programme it is expected that most 757-200PCF redeliveries will be to existing operators. This eliminates the complexity of introducing a new type.

RB211-powered aircraft with a Boeing and Precision Aircraft Solutions maximum zero fuel weight (MZFW) upgrade up to 200,000lbs can attain a gross payload of 84,000lbs/38,101kg and a range greater than 2,200nm. With a Boeing MZFW upgrade to 188,000lbs/85,275kg and a gross payload of 72,000lbs/32,658kg, it will have a maximum range of 2,850nm. Baseline aircraft with an MZFW of 184,000lbs/83,460kg, and operating at a gross payload of 68,000lbs/30,844kg, will have a range of 3,200nm.

Pratt & Whitney (PW) PW2000-powered aircraft with both a Boeing and Precision Solutions MZFW upgrade up to 198,000lb/89,811kg can achieve a gross payload of 82,000lbs/37,194kg, and a maximum range of 2,300nm. With a Boeing MZFW upgrade to 186,000lbs/84,368kg, the aircraft will have a maximum range of 3,000nm. PW-powered aircraft with a baseline MZFW of 184,000 lbs/83,461kg, and a payload of 68,000lbs/30,844kg will have a maximum range of 3,200nm.

According to Young, replacing the 757-200PCF is difficult, yet he adds that the A321-200PCF can operate 90% of the missions flown by the 757-200F.

"The 757-200PCF has a range of more than 8.5 hours, and when pushed it can complete nine-hour missions with a good size payload," describes Young. "Yet most of the fleet is not flying such long sectors, and some operators in Europe typically fly sector times from 45 minutes to 1 hour."

Short sector times mean that the highest maximum take-off weight



(MTOW) is not needed. Because of this, some operators are reducing the MTOW to lower operating costs in terms of landing and navigational charges that are usually charged by weight.

It is understood that existing 757-200F operators will want to add 757s before A321-200Fs. The many costs associated with adding a new fleet type include pilot training, maintenance training, tooling, and spare part and rotatable component inventory. Integrators such as DHL, however, agree contracts with operators of different fleet types so that they are not exposed to restructuring costs if a new type is required.

“Covid has freed up aircraft for conversions. The 757 is at an interesting point of its life, even on the cargo side, because we are now seeing retirement of older 757 freighters that have aged out, but we are still seeing new P-to-F conversions being performed,” says Adam. “According to analysis, the 757-200F fleet will increase over the next several years, including 90 new conversions and 60 retirements.”

It is forecast that the number of 757-200F retirements will increase from 2025 and 2026 onwards. Analysis suggests that there are about 100 suitable 757 conversion candidates remaining that were built after 1997. This number does not include aircraft in the Delta Air Lines fleet, because it is not possible to determine when they will be released onto the market. United Airlines is likely to retire its 757 fleet once it starts to take delivery of A321neos in 2023.

A321-200F

The A321 is the only narrowbody freighter that has a containerised lower

deck capacity. This has the potential to improve labour efficiencies by reducing ground-handling manpower and time. Using containers and a cargo loading system (CLS) in the lower deck separates shipments more easily, allows for transit stops, and better protects cargo from the outside elements.

“737 and 757 operators typically use the lower cargo hold on an ad-hoc basis, although the space has been utilised more during the pandemic. In the past, use of the lower cargo hold was seasonal or for last minute consignments,” explains Young.

The A321-200PCF’s total volumetric payload equates to 89% of the 757-200PCF’s total volumetric payload. If the 757-200PCF’s 1,790 cu.ft. of available lower hold bulk storage is not utilised, then the A321-200PCF’s total containerised volume is 12% actually more than that of the 757-200PCF’s total volume.

The 321 Precision Conversion A321-200PCF has a total of up to 15 main-deck positions, which include provisions for 13 AAA/AAV containers and either two LD3-45s or a PAG pallet, giving it a total main deck containerised volume of 5,979 cu.ft.

EFW’s A321-200P2F has provision to carry 14 AAA/AAV containers on its main deck, giving it a main-deck containerised capacity of 6,132 cu.ft. With a lower hold CLS installed, both the EFW and 321 Precision Conversion STCs have the ability to store 10 AKH/LD-45 containers within the belly, equating to 1,478 cu.ft. Both also have 208 cu.ft of bulk storage available.

The Sine Draco A321-200SDF has 14 available main-deck cargo positions giving it the ability to carry 13 AAA/AAV containers, and a single AAP/LD9. In this configuration it will have a main-deck containerised volume of 6,075 cu ft, and a

Good performance and low operating costs make the 727-200F popular, yet as the freighter’s useful economic service life ends, many operators must decide on the best suitable replacement from A321, 737 and 757 alternatives.

lower-deck containerised volume of 1,270 cu ft. In this configuration the A321-200SDF will have a total containerised payload of 7,345 cu ft.

The A321-200CCF can carry 14 AAA/AAV containers and a single LD3-45 on its main deck. Configuring the lower hold to store 10 LD3-45s will give the A321-200CCF a total containerised volume of 7,529 cu ft. (see table, page 47).

The A321-200F’s useful economic service life will depend on an aircraft’s age and utilisation rate. For example, an MSN built in 1999 that has accumulated a high number of flight hours (FH) and flight cycles (FC) will be determined to have a shorter useful lifespan as a freighter than a younger example with low rates of utilisation. Nevertheless, it is possible to assume a post-conversion useful economic service life of 20-25 years, which is not dissimilar to the 757.

In October 2021 there were six A321-200Fs in service, comprising five A321-200P2F and one A321-200PCF sub-types. As A321-200F conversion programmes are early in their development, data on utilisation rates is limited.

“Information to determine typical payload-range profiles is scarce because the number of aircraft in service is still small. I would assume that most aircraft will operate pan-continental routes within Europe, Asia, Middle East and the Americas; while a minority of aircraft will operate longer sectors, such as Europe to Dubai,” explains Centner.

According to critics, there is enough space at the moment for four A321-200 STC providers, yet it is difficult to predict if this will create an overheated market in the future. According to Centner, EFW has planned a steep ramp-up of production, and from 2023 onwards it is forecasting a capacity target of 30 redeliveries per year.

During this period of high demand, 321 Precision Conversions is also looking to increase its capacity to match demand.

“Planning for the required number of conversion kits was completed pre-Covid when demand was nowhere near what it is today, and A321-200s were in high demand as a passenger aircraft,” says Young. “Because of this, the initial planned output was about six aircraft during the first year of production scheduled for 2022. We have doubled the initial kit availability to 12 conversions in 2022 and are planning to complete 28 conversions by 2023 and 2024.”

According to Sagi, a main reason for C

PAYLOAD SPECIFICATIONS FOR LARGE NARROWBODY FREIGHTERS

Aircraft type	EFW A321P2F	321 Precision Conversions A321PCF
MTOW	205,030	196,211
MZFW	162,701	157,630
OEW	100,972	97,950
Payload - lbs	61,729	59,680
ULDs	14 AAA/AAY main deck 10 LD3-45 lower deck	13 AAA/AAY main deck + PAG 10 LD3-45 lower deck
Main deck containerised volume - cu.ft	6,132	6,094
Main deck tare weight - lbs	7,154	6,743
Lower deck containerised volume - cu.ft	1,270	1,270
Lower deck tare - lbs	1,720	1,720
Lower deck bulk volume - not used -	208	208
Total containerised volume - cu.ft	7,402	7,364
Total tare - lbs	8,874	8,463
Net payload - lbs	52,855	51,217
Max packing density - lbs / cu.ft	7.14	6.96
Volumetric payload @ 6.5lbs / cu.ft	48,113	47,866
Volumetric payload @ 7.5lbs / cu.ft	52,855	51,217

Aircraft type	C Cubed A321CCF	Sine Draco A321SDF
MTOW	205,030	196,211
MZFW	162,701	162,701
OEW	100,972	100,531
Payload - lbs	61,729	62,170
ULDs	14 AAA/AAY main deck + 1 LD3-45 10 LD3-45 lower deck	13 AAA/AAY main deck + AAP/LD9 10 LD3-45
Main deck containerised volume - cu.ft	6,259	6,075
Main deck tare weight - lbs	7,326	6,858
Lower deck containerised volume - cu.ft	1,270	1,270
Lower deck tare - lbs	1,720	1,720
Lower deck bulk volume - not used - cu.ft	208	208
Total containerised volume - cu.ft	7,529	7,345
Total tare - lbs	9,046	8,578
Net payload - lbs	52,683	53,592
Max packing density - lbs / cu.ft	7	7.29
Volumetric payload @ 6.5lbs / cu.ft	48,939	47,742
Volumetric payload @ 7.5lbs / cu.ft	52,683	53,592

Aircraft type	Precision Conversions 757PCF Rolls Royce	Boeing 727F
MTOW	250,000	203,100
MZFW	200,000	157,772
OEW	116,000	89,985
Payload - lbs	84,000	67,787
ULD	15 AAA/AAY main deck	12 88 x 126 pallets
Main deck containerised volume - cu.ft	6,570	5,280
Main deck tare weight - lbs	7,665	2,772
Lower deck containerised volume - cu.ft	n/a	n/a
Lower deck tare - lbs	n/a	n/a
Lower deck bulk volume - cu.ft	1,790	1,525
Total volume - cu.ft	8,360	6,805
Total tare - lbs	7,665	2,772
Net payload - lbs	76,335	65,015
Max packing density - lbs / cu.ft	9.1	9.6
Volumetric payload @ 6.5lbs / cu.ft	54,340	44,232
Volumetric payload @ 7.5lbs / cu.ft	62,700	51,038
Volumetric payload @ 8.5lbs / cu.ft	71,060	57,843



Cubed to have focused on delivering the A320-200CCF conversion to market ahead of the company's A321-200CCF conversion is the abundance and reasonable price of A320 conversion feedstock compared to the relative scarcity of A321 conversion feedstock.

In its GMF, Airbus states that at the beginning of 2020 there were 2,030 dedicated jetliner freighters in service. Given that A321s, 727-200Fs and 757-200Fs account for 361 units, the LNB category accounts for 18% of the freighter fleet.

In the 2020 WACF, Boeing states that the freighter fleet totalled 2,010 units, of which 18% (361) have a payload of 25-35 tons.

Airbus asserts that 540 freighters of all types in the current fleet will still be in service in 2040, and 97 of these units (18%) will be in this payload category. Using Boeing's projection that 830 of the existing freighter fleet will remain in service by 2040, it can be assumed that 18% of these remaining aircraft (148) will be LNBs.

In its GMF, Airbus forecasts that 1,490 freighters of all types will be replaced by 2040; Boeing gives the same figure in its WACF. Assuming 18% of all replacement aircraft will be LNBs, it is possible to assume 212 (WACF) to 268 (GMF) new replacement freighters will be needed by 2040. This is an average of 11-14 aircraft per year.

In addition to replacements, total dedicated freighter growth figures are forecast at an additional 950 (GMF) to 1,250 (WACF) aircraft over the 19-year period. Again, if 18% of these are large narrowbodies, it can be assumed that another 171 (GMF) to 225 (WACF) new freighters with 25-35-ton payloads will be

needed to meet growth rates by 2040.

It is therefore possible that there is a total requirement for 439 (GMF) to 586 (WACF) dedicated freighters to enter service by 2040 in this category.

Deducting aircraft in service today that will remain in the fleet by 2040, it is possible to assume that 437 (WACF) to 439 (GMF) new LNB freighters will be required over the next two decades.

Conservative

Precision Conversions has said that 50 new 757-200PCF conversions may be possible before the programme's end. After the initial ramp-up phase, four A321-200F conversion facilities are forecasting yearly output of 20-30 units, totalling 80-120 conversions per year.

This suggests that the future market share of LNB freighters will increase from 18% or the majority of aircraft in-service today are retired. It is possible that both OEM forecasts are conservative in terms of speculating the total requirement for new and replacement freighters in this bracket for the next two decades.

"Freighter demand is at an all-time high. Whether what we are seeing is a shifting of demand to earlier years or continued high demand into the foreseeable future is difficult to predict. I think it is safe to say that in 10 years' time Airbus will account for most freighters in the narrowbody market," says Sagi.

There is an element of 'boom or bust', meaning the market requirement for new LNB freighters over the next 20 years will not be linear, making static mathematical assumptions about demand meaningless.

"One of the concerns on the narrowbody side is that we are starting to see a lot more speculative conversions

Lack of suitable 767-300ER feedstock is driving demand for the 757F, and it is possible that there is up to 50 more 757-200PCF conversions before the programme's end. The robustness of the 757 airframe translates to a long economic service life as a freighter.

taking place without lessees lined up on the other side, just in the hope of feeding this growing market," says Guthorn.

High numbers of orders for P-to-F conversions mean that many conversion facilities are ramping up capacity to match demand. There are fluctuations within the market and according to Centner there will be 'upturns and downturns' within the market, and it is better to avoid 'too steep a ramp-up in capacity that is difficult to fill during downturns', so an optimum must be found.

According to Guthorn, there will be an excess of supply in this category until 2023. Including the 737NGs, Guthorn expects the narrowbody freighter fleet to grow to 1,100 units in the next five years and to 1,250 over the next decade.

"It is possible that the current boom in demand for conversion means we are working on the replacement cycle earlier than forecast," explains Young.

"Whenever there is a downturn the first aircraft to be parked are typically the older assets. Before Covid I did not foresee the replacement cycle starting until 2026 and 2027, so we are likely to be producing the replacement freighters today."

At the same time the 757-200F is a robust platform, meaning many could remain in service for many years, and retirements could be based on how well the OEM supports the engines and the aftermarket.

"Depending on whose forecast you read, the in-service fleet of narrowbody freighters over the next 20 years is anticipated to grow by 50-60%," says Stafford. "Combine that with Cirium's forecast for 70% of the current in-service narrowbody freighters to be retired over the next 20 years and the level of demand for narrowbody freighters is clear. As there are no narrowbody production freighters at this time, demand for narrowbody conversion slots has been tremendous. We have certainly seen a significant level of interest in our A321-200SDF programme."

The A321-200F is a new generation aircraft ideally suited to well-funded integrators and operators. Yet many 727-200F operators may look towards the 757-200F as a replacement, because the 737NG is too small. [AC](#)

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