

Aircraft Values

Presentation covering:

Aircraft appraisal – valuation theory versus actual trading prices;

P2F aircraft types, value trends & pricing – impact on narrow & wide body programmes; and

Future value performance and longer term demand for new tech freighters.

Appraisal Sources

Two sources of professional appraisal accreditation for aircraft valuation services:

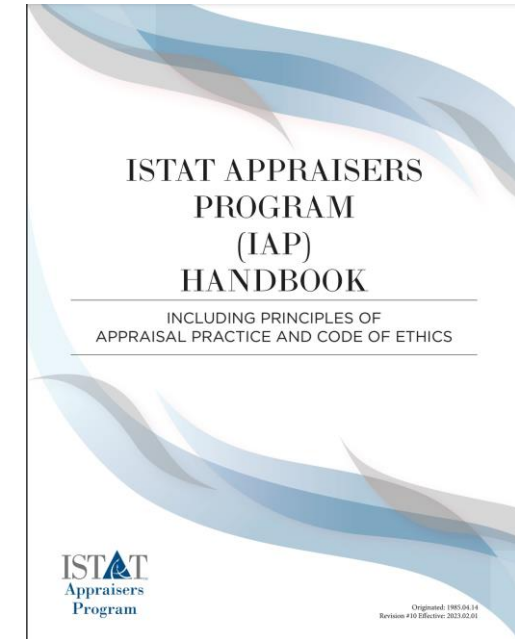


Formed in 1952, an affiliation of professional appraisers covering a multiple of disciplines



Founded in 1983, ISTAT is an association for aviation professionals that provides networking and educational opportunities for members.

Within ISTAT there is a group of appraisers that work to elevate the appraisal profession within the global aviation community.



Appraisal Practice

Determination of: value; lease rate; or non-monetary value (e.g. useful life remaining); & could include a review of appraisal reports originally prepared by others

Objective: to provide a numerical result, either as a range or most probable amount of a value now or at some future point in time.

The numerical result is objective and unrelated to the desire, wishes or needs of the client who engages the ISTAT Certified Appraiser to conduct the appraisal.

Theoretical Values

Base Value is the Appraiser's opinion of the value of an aircraft:

- in a stable market with a reasonable balance of supply and demand;
- assumed physical condition is average with maintenance status as described;
- Unencumbered, single unit transaction valued for highest & best use;
- Parties are willing, knowledgeable and under no duress; and
- Negotiated in an open and unrestricted market on an arm's length basis with adequate time for marketing exposure

Market Value is the Appraiser's opinion of the most likely trading price that may be generated for an aircraft under the market conditions that are perceived to exist at the time in question (i.e., not necessarily stable with reasonable supply and demand), but otherwise applies the transaction assumptions used with Base Value.

Other Value Definitions include:

Residual Value; Lease Encumbered Value; Distressed Transaction Value; Soft Market Value; Part Out Value; Disassembly Value & Scrap Value.

Full Life, Half Life & Maintenance Adjustments

Full Life – all maintenance tasks and LLPs have 100% of life remaining – theoretical, even on a new aircraft;

Half Life – all scheduled maintenance events are at mid point and all life limited components are at mid-point of ultimate life.

A320 / CFM56-5B

Half Life to Full Life 2023 US\$'s		
Major Event	A320 Cost	Half Life
C Check	\$ 332,080	\$ 166,040
6Y Check	\$ 803,419	\$ 401,709
12Y Check	\$ 803,419	\$ 401,709
Landing Gear	\$ 407,066	\$ 203,533
APU	\$ 374,929	\$ 187,464
Engine PR	\$ 8,000,000	\$ 4,000,000
Eng LLP	\$ 9,878,733	\$ 4,939,366
Totals:	\$ 20,599,644	\$ 10,299,822

B747-400F / CF60-80

Half Life to Full Life 2023 US\$'s		
Major Event	B747 Cost	Half Life
C Check	\$ 1,680,000	\$ 840,000
D Check	\$ 5,460,000	\$ 2,730,000
Landing Gear	\$ 1,470,000	\$ 735,000
APU	\$ 1,207,500	\$ 603,750
Engine PR	\$ 24,592,000	\$ 12,296,000
Eng LLP	\$ 38,606,627	\$ 19,303,314
Totals:	\$ 73,016,127	\$ 36,508,064

Leased Assets – majority of new aircraft leases contemplate a full life aircraft at redelivery, i.e., lease return conditions plus maintenance reserves or compensation = Full Life.

Valuation & Pricing Diversity

Lessor Trade (Q2 2018) lease encumbered asset that had full life value:

- Appraiser Market Values range – CEO \$31.91m to \$38.54m;
- Perceived value range of buyers - \$38m to \$46m; which
- Recognises value difference between half & full life

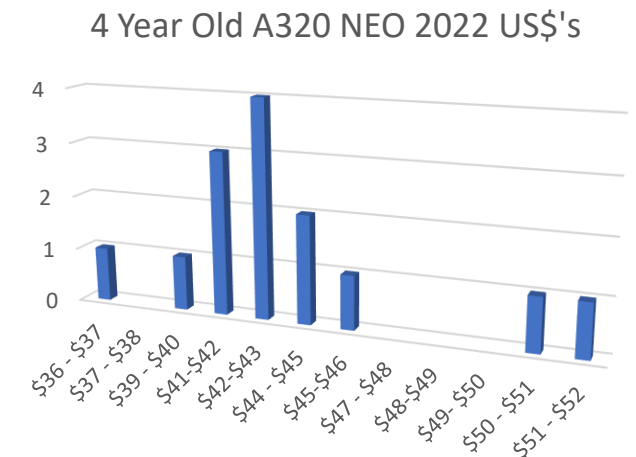


Appraiser Market Value (Jan 2021) same age of A320:

- Appraiser Market Values range – CEO \$22.55m to \$28.65m & NEO \$32.88m to \$36.77m;
- Covid era fleet utilisation rising but significant airline distress & lessor restructuring activity on going – hence no trading

Recent Lessor Trade (Q4 2022) lease encumbered A320 NEO with full life value:

- Appraiser Value Range - \$40.12m to \$45.78m;
- Perceived value range of buyers \$36m to \$52m; but
- Majority of Buyers bid in the appraised value range; thus
- Less value attributed to value of full life lease conditions.



Value Sources

OEM New Aircraft Price: there's a price list and a specification cost but:

- The significant spread in discounts provided by OEMs; plus
- Incentives; & Credits, all reduce the net delivery price

Buyers: whilst discounts vary between airlines and lessors the new production price for two aircraft of the same model delivering at the same time is impacted by:

- Contracted escalation;
- Airline specification features; and
- Financing arrangements – e.g. lessor PLB at delivery versus balance sheet use.

Post Production very few examples of airline to airline trading exist, most trading takes the form of:

- Airline SLBs;
- Lessor to lessor trading of encumbered assets; and
- Sales by airlines or lessors as part of fleet renewal programmes, generally for part out and P2F programmes.

Distressed Market Value Movements

A survey of market value reductions across a selection of appraisers provides the summary of value deductions that occurred during downturns: as expected:

- In production aircraft fare better than older aircraft; and
- Narrow-bodies with the larger user base and significantly lower ownership and operational costs have best value retention.

Survey of Market Value Declines During Downturns				
Aircraft	Category	2001/02 (9/11)	2008/09 (Financial Crisis)	2020/22 (Covid)
Narrow-Body Aircraft	Out of Production	22% to 46%	15% to 39%	9% to 48%
	In Production	10% to 24%	12% to 33%	2% to 11%
Wide-Body Aircraft	Out of Production	16% to 34%	22% to 58%	4% to 60%
	In Production	10% to 18%	5% to 20%	5% to 41%

Valuation v Pricing Conclusions:

Traded pricing sources are not transparent at any stage of an asset's lifecycle, even two apparently similar, separate asset sale transactions cannot be compared directly to establish market value

Appraised value range not dissimilar to encumbered trading range but leased asset trading clearly has a premium over appraised values, reflecting the economic benefits of the lease

Whilst trading requires a price that is acceptable to buyer, the seller must be motivated to sell, post covid era trading has demonstrated that lessors don't entertain distressed sales of assets

Given the myriad of factors involved in determining a trading price, it's important that Appraiser's data remains a value reference source when determining a trading price. Appraisers should not become price setters.

Perceived "value in use" dynamics of buyers, particularly used assets, can drive significant variation in offers received, bidder pricing analysis is impacted by:

- Asset utility;
- Maintenance Status; and
- Specification & configuration

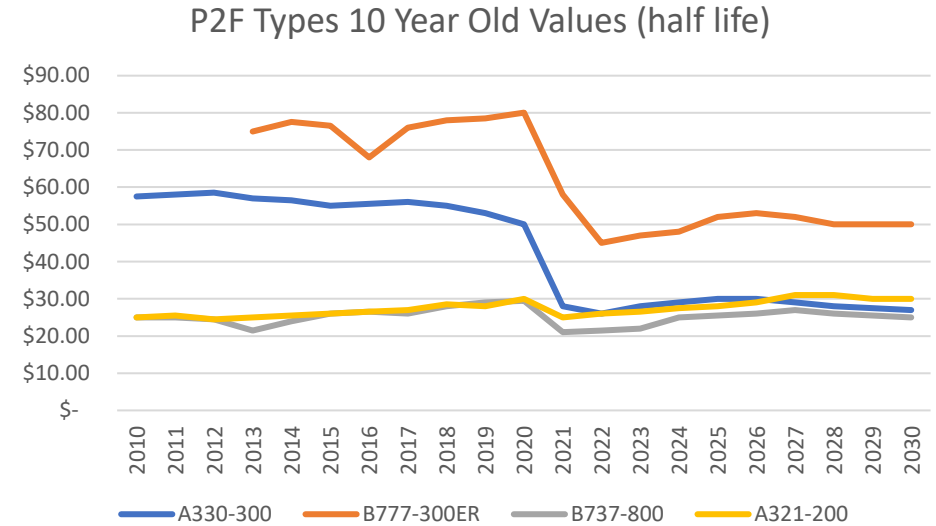
Freighter Aircraft Values

Current Market Values Half Life (unless new) \$m					Market Lease Rentals
Freighter Type	New	10 Yrs Old	15 Yrs Old	20 Yrs Old	Range (Oldest to Youngest)
A321-200P2F	n/a	n/a	\$ 26.00	\$ 22.00	\$225,000 to \$270,000
A330-200F	n/a	\$ 42.00	n/a	n/a	\$250,000 to \$650,000 (when new)
A330-300P2F	n/a	\$ 46.00	\$ 42.00	\$ 32.00	\$250,000 to \$375,000
B737-800P2F	n/a	n/a	\$ 24.00	\$ 21.00	\$160,000 to \$205,000
B747-400F	n/a	n/a	\$ 36.00	\$ 28.00	\$275,000 to \$380,000
B747-8F	n/a	\$ 95.00	n/a	n/a	\$775,000 to \$1,450,000 (when new)
B757-200P2F	n/a	n/a	n/a	\$ 15.00	\$175,000 to \$205,000
B767-300ERF	\$ 85.00	\$ 46.00	\$ 37.00	\$ 28.50	\$230,000 to \$675,000 (new)
B777-200LRF	\$ 125.00	\$ 95.00	\$ 78.00	n/a	750,000 to \$1,350,000 (new)
B777-300ERP2F	n/a	\$ 85.00	\$ 76.00	\$ 65.00	\$650,000 to \$725,000

P2F Feedstock Aircraft Value Trends

Widebody aircraft:

- Value performance typically poor due to limited secondary market demand;
- Initially the impact of covid led to significant reduction in values; however
- New aircraft supply constraints and passenger demand recovery has led to operators retaining preferred widebody types hence a small improvement in values
- P2F programmes supporting values of convertible wide-body types



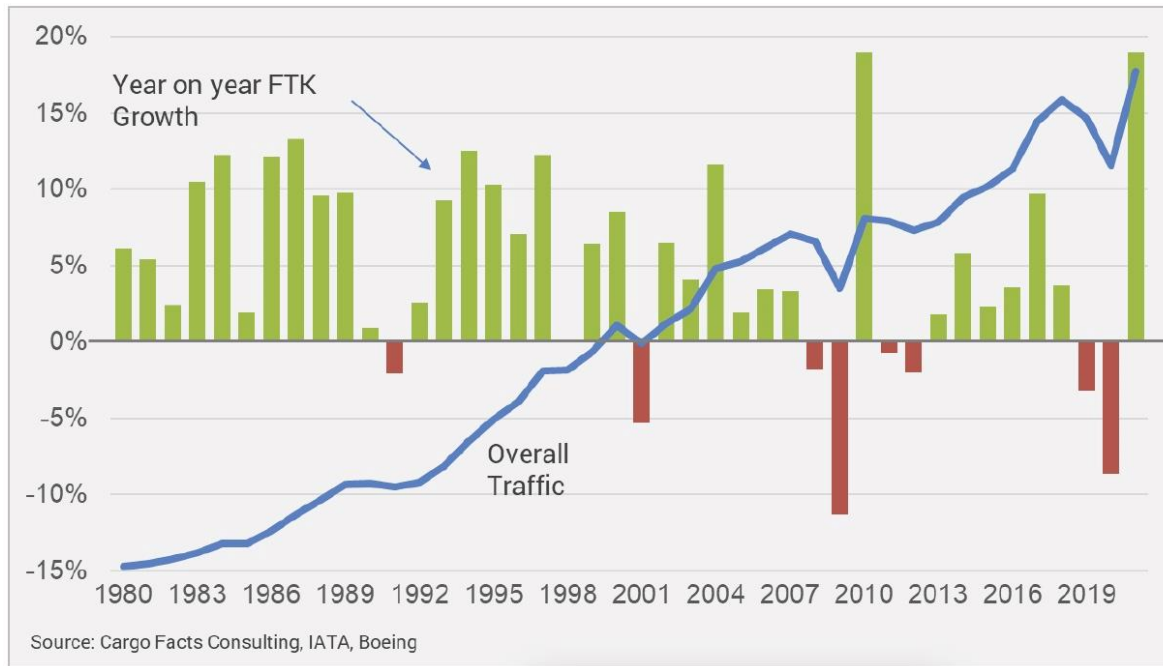
Narrow-body aircraft:

- Values of most popular types typically stable due to large user base and demand;
- Initial reductions in value from 2020 have recovered, due to:
 - P2F feedstock demand; and
 - New aircraft supply constraints.

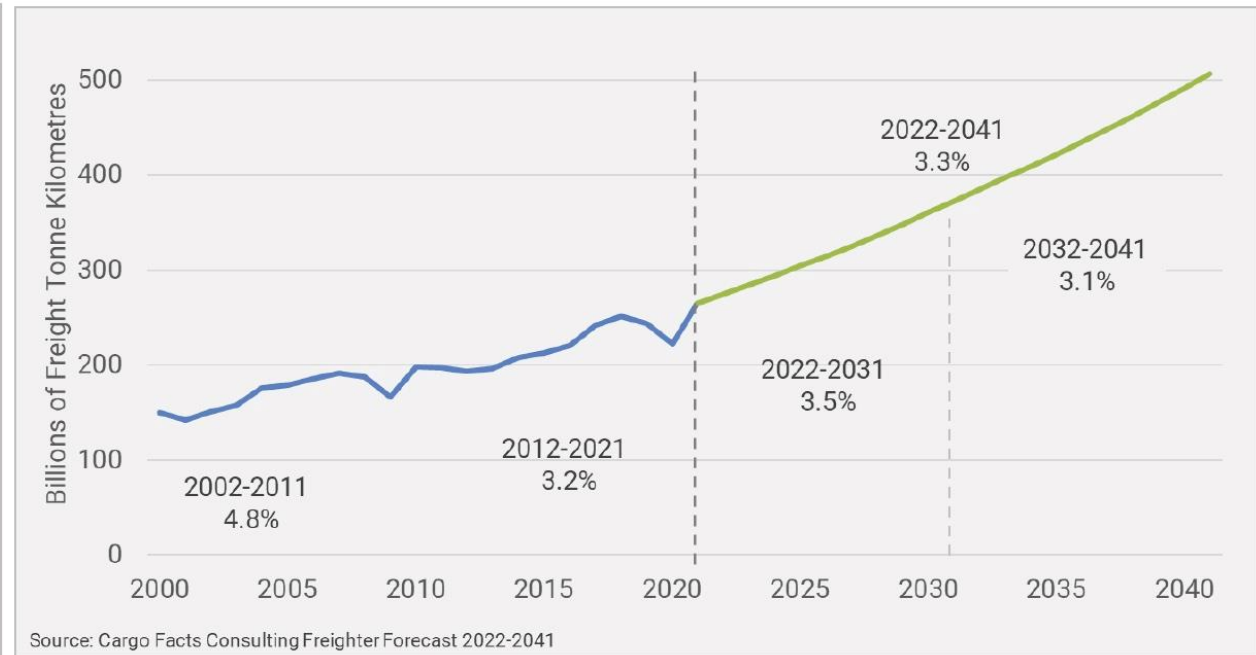
Air Cargo

- Is a \$170B industry on a global basis, dedicated freighter aircraft generate 90% of industry revenue (Boeing WACF 2022);
- Represents 1% of world trade tonnage but accounts for approximately 35% of the value of goods trade (Boeing WACF 2022).

Air Traffic Growth 1980 - 2021



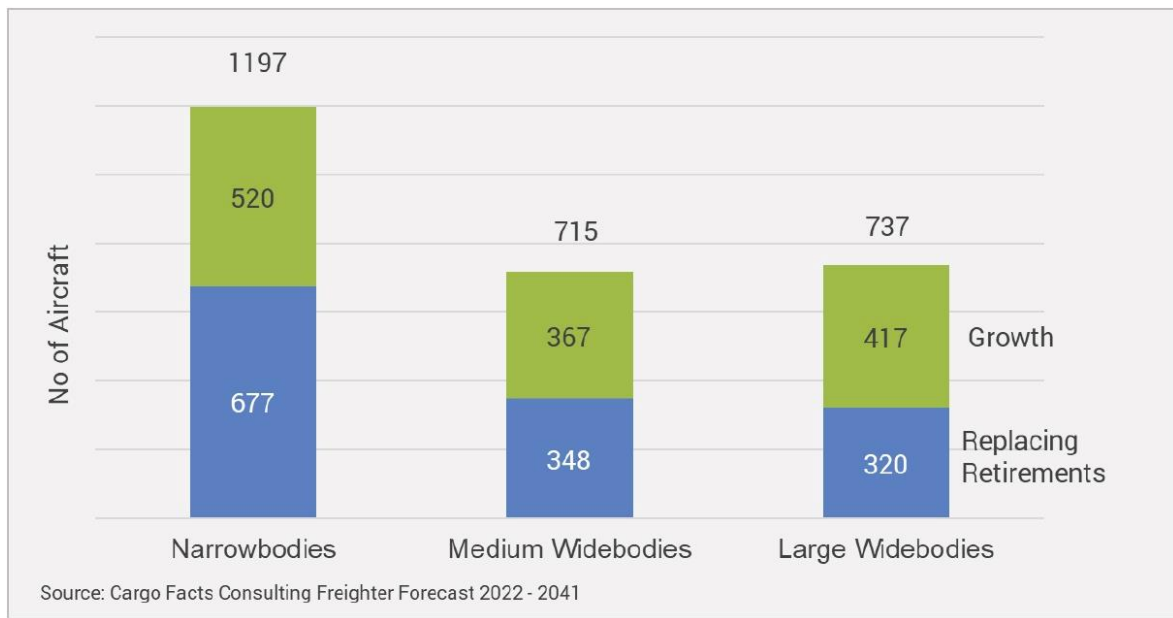
Air Traffic History & Forecast



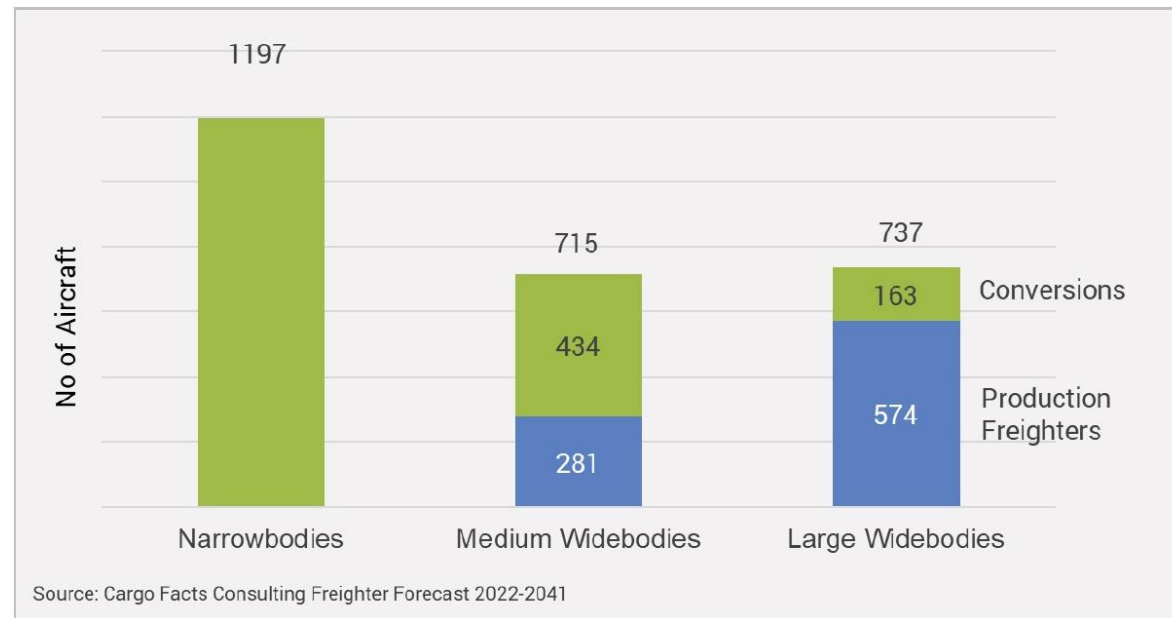
Air Cargo Fleet Development

Cargo Facts Consulting forecasts between 2022 & 2041 the addition of 2,650 jet freighters and 390 feeder aircraft to cater for growth and retirements. Dedicated jet freighter fleet will grow from 2,000 to 3,400 units and the feeder fleet from 260 to 420 units.

Growth & Replacement Jet Freighters 2022 - 2041



New & Converted Jet Freighters 2022 - 2041



Air Cargo Fleet Replacements

Narrow-body < 45 tonnes:

- A320 & A321 & B737NG replacing B727, B737 Classic, B757, DC9 & MD80;
- Operate in regional Markets up to 2,000 hours per year

Medium wide-body 40 to 80 tonnes:

- A330-200 & -300 & B767-300ERF replacing older B767Fs, DC10Fs, A300F & A310F
- Operate in regional and inter-regional markets up to 2,500 hours per year

Large wide-body 80+ tonnes:

- B747-8F, B777F, B777-8F, B777-2ERP2F & -300ERP2F, & A350F replacing older B747F & P2F variants and MD11F;
- Operate on transoceanic routes up to 4,500 hours per year

Narrow-body Conversion Study

2021 Analysis:

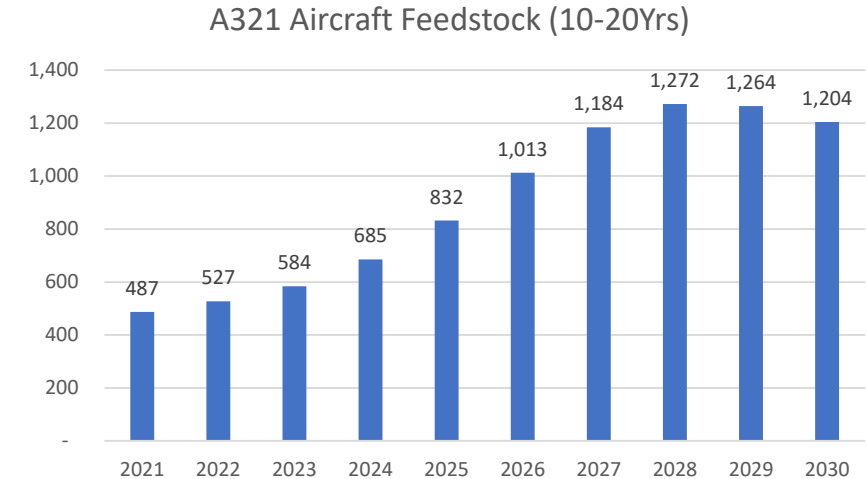
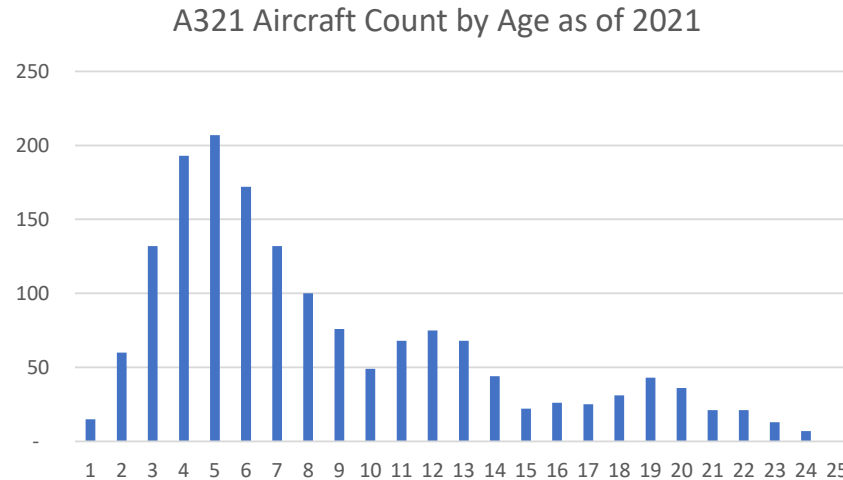
- Narrow-body fleet stood at 750 aircraft in mid 2021;
- 560 aircraft due to be retired over the next 20 years;
- 1,080 aircraft to be added over the next 20 years translating to a total narrow-body fleet size of 1,270

Aircraft Type	2020 Fleet	2020-2039 Estimated Retirement	2020-2039 Addition	2039 Fleet
B727-200	47	(46)	-	1
B737-200/300	132	(131)	-	1
B737-400	160	(120)	-	40
B737-700/800	51	(5)		46
B757-200	336	(234)	-	102
Other	24	(24)	-	-
2020-2039 Converted Aircraft			1,080	1,080
TOTAL	750	(560)	1,080	1,270

Of the 1,080 aircraft to be added, 95% of additions will be sourced from the Airbus A321 and Boeing B737-800

Narrow-body Feedstock A321

2021 Study:

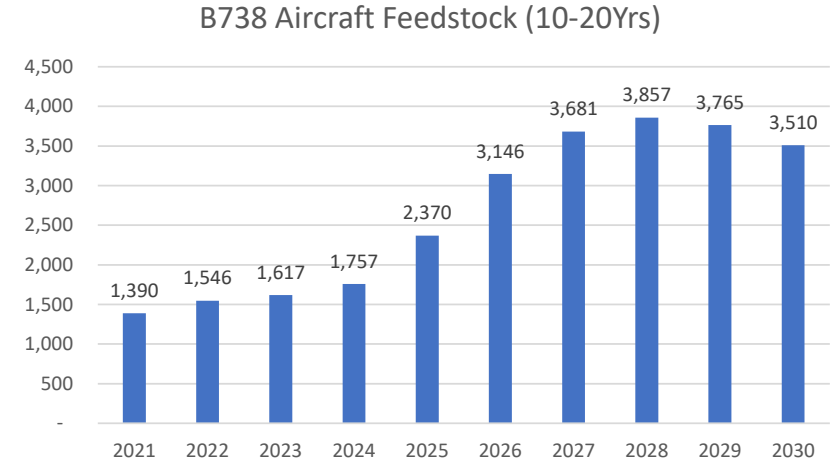
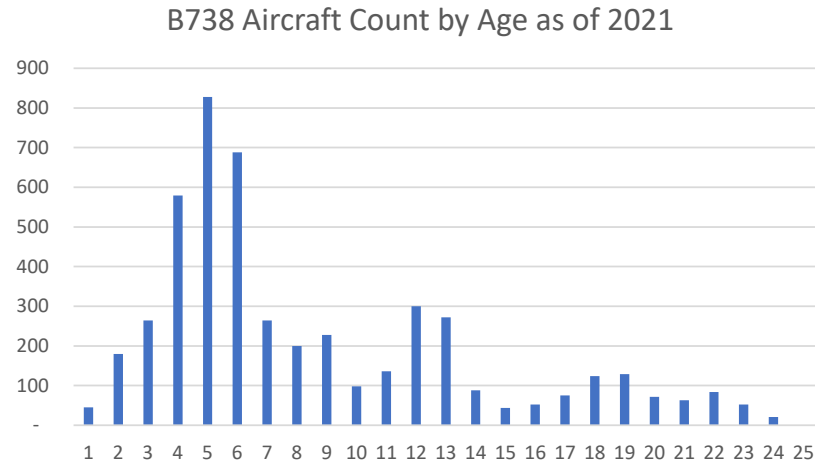


Today:

- 18 aircraft in service with 6 operators, by the end of 2023, there should be 30 A320/321 P2F & 4 A321PCF aircraft in service;
- EFW's orderbook exceeds 100 aircraft;
- Majority of converted aircraft are over 20 years of age at point of conversion; and
- Feedstock constrained due to:
 - Strong A321 prices;
 - A321NEO delays & new tech engine reliability; and
 - passenger airlines upsizing from smaller A320 family aircraft as passenger demand increases.

Narrow-body Feedstock B737NG

2021 Study:



Today:

- At the end of 2022, 132 B737-800 & 10 737-700 freighters were in service with 44 airlines;
- Majority of conversions cover 16 to 18 years of age at point of conversion; and
- Boeing has increased production capacity outside of China to meet demand;
- Feedstock constrained by 737MAX delays and new tech engine reliability leading to passenger airlines retaining B737NG aircraft to meet passenger demand

Widebody Summary

B777:

	B777F	B772ER/LR	B773ER
Fleet	239	403	819
Operators	25	45	51

- 100 Tonne, B773ERSF by IAI ordered by aercap (lessee Kalitta Air) Emirates, EVA Air, Cargojet & Challenge Group.
- Kansas Mod Centre 94 tonne programme commitment from launch customer Backbone Freighter Leasing for 3 firm & 7 options;
- Mammoth 777-200LRMF & 300ERMF programme commitments from launch customers AviaAM (-300ERMF) & Cargojet (4 x -200LRMF)

A330:

	A330F	A330-200P2F	A330-300P2F	A330-200	A330-300
Fleet	38	8	15	495	609
Operators	11	3	6	81	66

- DHL launch customer for -300P2F;
- EFW has commitments for just under 100 A330 conversions;
- EFW P2F Lessors include CDB Leasing & Altavair;
- Avolon teamed up with IAI for 30 conversions slots on the A330-300BDSF

Air Cargo Operators

Passenger Aircraft Only

Belly Space Only,
e.g., BA

Cargo capacity using passenger aircraft belly space, only operate on passenger networks

Dedicated Cargo Aircraft, owned or subject to long term operating leases

Combination Carriers,
e.g., Emirates

Provide both dedicated main deck cargo and passenger aircraft belly space capacity

Cargo Only,
e.g., Cargolux

Main deck capability: general freight, charter & specialized carriage

Historically have used production freighters but the new P2F programmes provide an opportunity to secure efficient, current technology aircraft to develop cargo services

Dedicated Cargo Aircraft, mixture of owned aircraft with operating leases and ACMI / CMI

Express Carriers,
e.g., Fedex, UPS, DHL, SF Express

Operate main deck freighter fleets of all sizes providing time definite services and general air cargo services

Have in house core operational fleets (owned and leased) but also rely on differing levels of subcontracting to supplement demand:

- Direct ACMI e.g., Kalitta supports DHL &
- CMI support using assets leased to CMI AOC holder

Expect majority of P2F aircraft to operate with express carriers and charter airlines

Narrow-body Freighters

Most latest technology converted **narrow-body freighters** are owned by:

- Lessors using P2F as a monetization & economic life extension strategy for assets that would otherwise be retired, e.g., BBAM, AerCap; and
- Airlines or express carriers that provide time definitive services and ACMI capacity, e.g., Qantas, Titan Airways, DHL, SF Express

Stronger airline credits and lessors will initially own these latest generation narrow-body freighter types due to:

- Existing ownership of feedstock aircraft;
- Prohibitive cost of acquiring aircraft for conversion; and
- Ability to secure P2F conversion slots.

Limited initial trading of these assets has seen mostly SLB and lessor or investor trading activity.

Wide-body Freighters

Generally, **Production freighters** will be ordered by:

- Airlines with strong balance sheets & established cargo or express carrier networks, e.g., Fedex, Cargolux, Emirates, Air France; plus
- Some lessors (e.g., ALC) will order new production freighters to support a more diverse investment strategy compared to industry peers;

Most **Converted wide-body freighters** will be owned by:

- Lessors using P2F as a monetization & economic life extension strategy for assets that would otherwise be retired, e.g., Altavair, BBAM, CDB Leasing; and
- Express carriers that provide time definitive services and general air cargo capacity, e.g., Fedex, DHL, SF Express

Stronger airline credits and lessors will initially own these latest generation widebody freighter types due to:

- Prohibitive cost of new production aircraft; and
- Extensive P2F conversion cost.

Initial trading of these assets will be SLBs and lessor or investor trading

Demand Headlines

- B777F outstanding order book of 101 aircraft to 19 operators, production ends in 2027;
- B767-300ERF outstanding order book of 57 aircraft, 29 x FEDEX & 27 X UPS;
- B777-8F, 46 aircraft ordered by Ethiopian, Lufthansa & Qatar, deliveries from 2027;
- A350F, 35 aircraft ordered by 6 operators and 1 lessor, deliveries from 2025;
- B777-200ER/-300ER P2F programmes, still in conformity aircraft certification stage, should start delivering from 2024/25:
 - IAI has three production lines planned for deliveries to AerCap, Emirates, EVA Air, Cargojet and Challenge Group;
 - Mammoth and KMC have more than 10 slot orders;
- A330-300P2F, EFW increasing conversion line capacity – aiming to deliver 25 aircraft per year from end of 2023 due to strong demand plus IAI entering A330 conversion market;
- A320/321P2F, EFW increasing conversion facility capacity due to strong demand, Precision programme now delivering aircraft with two conversion facilities, two other programmes undergoing certification;
- B737-800BCF, Boeing has developed additional conversion facilities in Costa Rica, UK and India, plus additional conversion programmes from IAI (30+ slot orders & options) and AEI (50 slot order just announced)

Supply Estimates

Based on:

- Forecast for approximately 2,650 additional freighter aircraft over the next 20 years;
- Historic new production delivery performance & outstanding OEM orders;
- P2F programme delivery performance to date & consideration of additional conversion facility ramp up; and
- Timing of new P2F programmes that increase overall supply....

Theoretically there's potential for over-supply in the longer term but considering historic production rates and factoring in increased freighter delivery activity there should be strong demand for latest technology freighter aircraft over the next 15 years.

		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Narrow-body	Annual	90	95	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
P2F Only	Cumulative	90	185	285	385	485	585	685	785	885	985	1085	1185	1285	1385	1485	1585	1685	1785	1885	1985
Widebody	Annual New	30	30	35	40	42	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
	Annual P2F	16	20	20	22	22	22	24	26	30	30	30	30	30	30	30	30	30	30	30	30
	Cumulative	46	96	151	213	277	347	419	493	571	649	727	805	883	961	1039	1117	1195	1273	1351	1429
Total Cargo Fleet Additions		136	281	436	598	762	932	1104	1278	1456	1634	1812	1990	2168	2346	2524	2702	2880	3058	3236	3414

Conclusions

- Air cargo's primary use remains the movement of high value, fragile or perishable products that require reliable and timely delivery services;
- Historic performance, combined with continuing global trade demand supports the view that air cargo services are set for continued growth;
- A significant portion of the existing freighter fleet comprises older technology aircraft types, thus operating costs, increasing maintenance burden and pressure to achieve a sustainable aviation sector are factors driving fleet replacement;
- New production freighters will be delivered to dedicated cargo carriers and the larger express carriers with strong balance sheets; whereas
- The bulk of converted aircraft will deliver to express carriers and ACMI operators;
- Specialist lessors will continue to play a major role in providing converted and older examples of current production freighter aircraft to the sector;
- Limited supply of new production freighter aircraft along with the constrained availability of quality P2F feedstock, will help mitigate the risk of over-supply.

Values of latest technology freighter aircraft, whether production or converted will perform strongly; and values of quality P2F feedstock passenger aircraft will be stable.