iba
insights in flight

Valuation & Economics of aircraft dismantling

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www.iba.aero

IBA is an award-winning aviation market intelligence and consulting company

Global presence with a track record of success

- 33+ year track record with head office based in Greater London
- Fully independent – IBA does not own, finance or lease aircraft
- Advisor to world's top Banks, Lessors, Airlines and OEMS

Experienced team of aviation professionals

- International team of over 100 people based in Europe, North America, China and Japan
- Experienced team of former Airline executives, aircraft engineers, banking professionals and data experts
- 5 certified senior appraisers
- Full-time global technical team

Recognised as a leader by aviation industry peers

- **Appraiser of the Year 2022** - Airline Economics Aviation 100 Awards
- **Sustainability Technology Award** 2022 – IBA's Carbon Calculator – A.E.
- Approved by the **International Capital Markets Association (ICMA)** to provide verification and second party opinion

IBA offers a broad range of aviation data and consultancy

Valuation

- Commercial aircraft
- Engines
- General aviation
- Helicopters
- Business Jets

Consulting

- Fleet strategy
- Airline risk
- ESG strategy
- Cost benchmarking
- Market reports
- Litigation support

Insight

- Fleets
- Values
- Liquidity
- Flights & seat capacity
- Aircraft intelligence reports

Technical

- Aircraft inspections
- Damage inspections
- Cargo conversion
- Lease redeliveries

Asset Management

- Aircraft management
- Recovery
- Aircraft Remarketing
- Transitions
- Transaction advisory

NetZero

- Carbon Emissions Calculator
- Projections

InsightIQ Carbon Emissions Calculator (CEC)

The benchmark for aviation ESG analysis. Supporting sustainably linked finance, carbon offsets and ESG reporting.

Carbon Emission outputs by:

- MSN and Aircraft Model
- Portfolio and Organisation
- Geography
- SAFs
- Average $C0_2$ per Mile
- Ratio of SAF Usage
- Load Factor Calculations
- Average Emissions per Seat, per Mile

The InsightIQ CEC illustrates multiple assets and fleets, actual and potential, to inform on emission reductions, fleet selection, competitor benchmarking, ESG reporting requirements and deal origination.

Dedicated Technical team with 30+ years of experience and deep expertise

- ✓ Global team available 24/7 with strong airline connections
- ✓ In-house engineering expertise provides accurate asset condition information
- ✓ Well connected and respected with OEMs, MRO and regulators

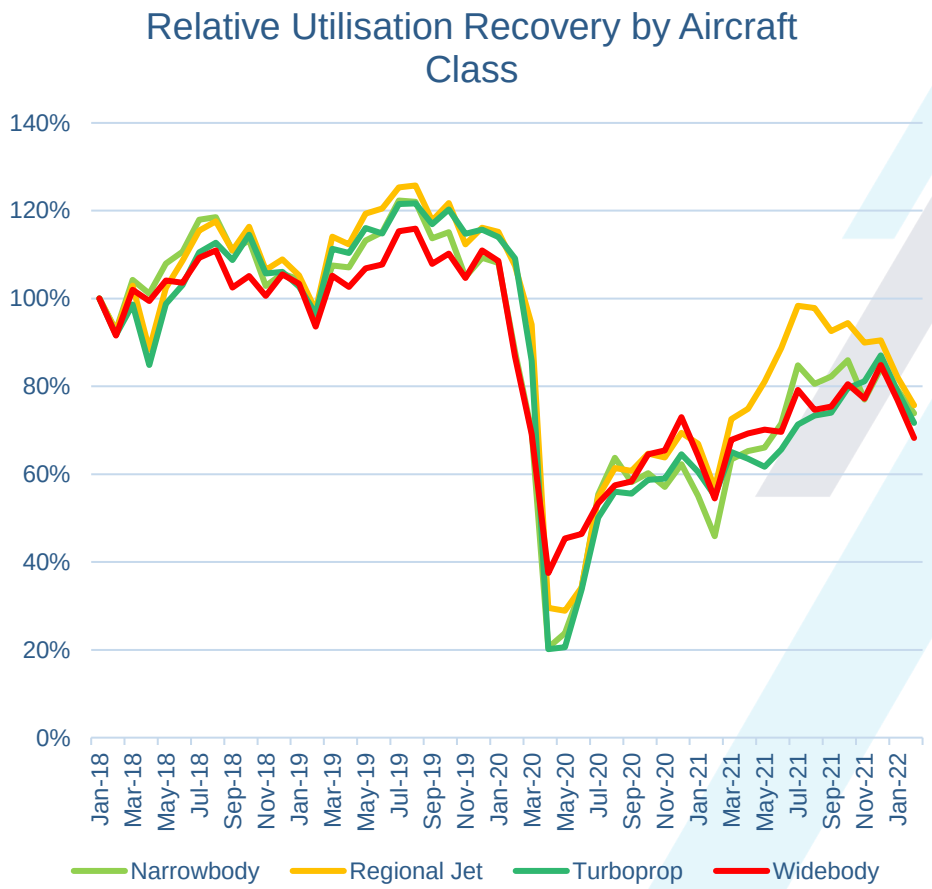
- ✓ Inhouse valuation expertise with ISTAT accredited team
- ✓ Redelivery support, records workscopes
- ✓ Lease negotiations
- ✓ Ongoing asset management if required

Market Update

2020-2022 Pandemic

Coming out the other side?

- Omicron scare short lived but cases rising globally
- Borders are opening up and rules are softening
  - Points to a better 2022 recovery
- Values and Lease Rates still subdued
- 2021 saw improvements
  - Freighter and US/Chinese Domestic driving growth
  - Increasing appetite – thought still at a lower volume
  - SV Demand Recovery slow but steady



Ukraine conflict

How is the engine market reacting

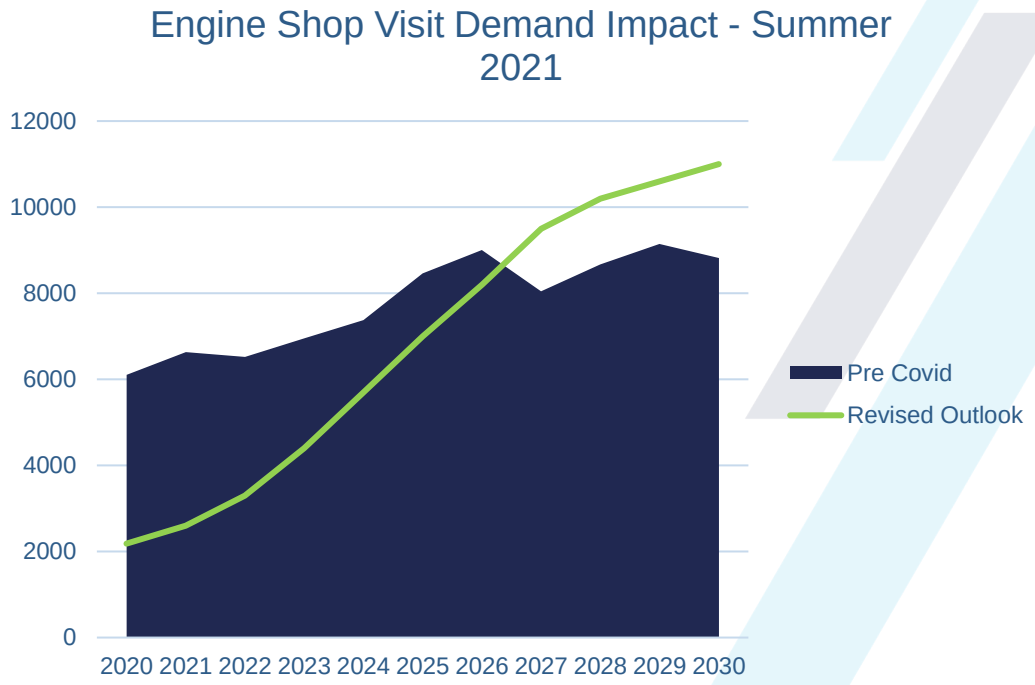
- Aircraft lessors appear to have taken the brunt
  - Still reflects many fitted engines
- Impossible to monitor spare engines within Russia
  - Lessor feedback suggests minimal fleet in Russia
  - Handful of engines recovered but expected to be a rare occurrence
- OEM PBH support appears the most common mode of spare engine support
- Efficacy of cape town in question?

Engine Type	Count	In Service Fleet	% Fitted Fleet
CFM56-7B	382	13,590	2.81%
CFM56-5B	368	7,808	4.71%
SaM146	278	404	68.81%
PW1100G	78	1,944	4.01%
GE90-110/115	78	2,176	3.58%
CF34-3A	74	118	62.71%
V2500-A5	66	5,962	1.11%
PW120	58	3,842	1.51%
LEAP-1A	54	2,336	2.31%
CFM56-3	46	1,806	2.55%

Outlook

Expectations and potential revisions

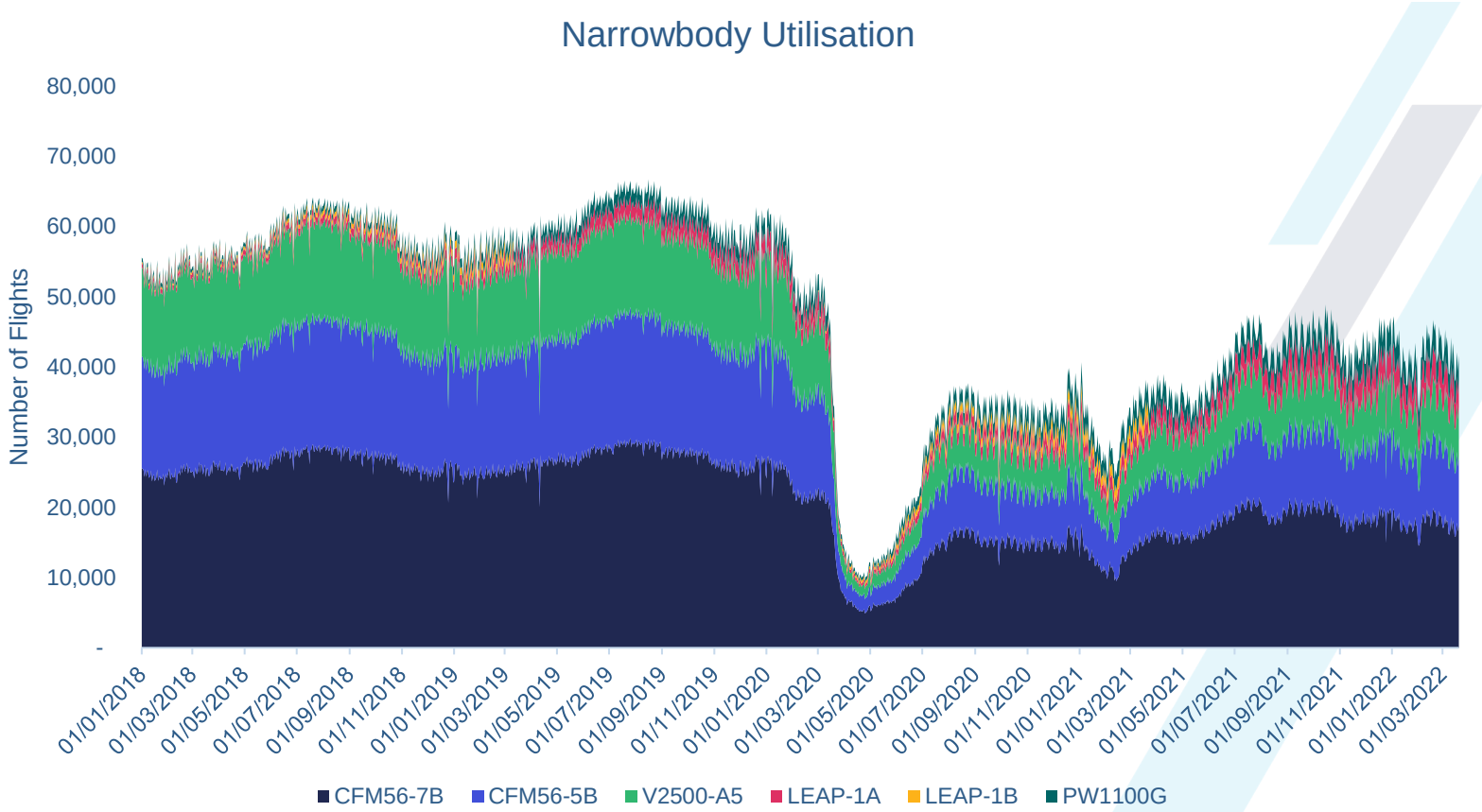
- Ukraine - Engine lessors less impacted by sanctions?
  - Maintenance, Records and Retrieval
  - Escalation could have severe impacts
- 2022 likely not to see the level of recovery we had hoped for
  - Ukraine
  - Inflation
  - Oil price volatility
- SV demand continues to be slow
- ESG increasingly important – Boards increasingly unwilling to invest in older material



Trends and demographics

Narrowbody Outlook and health

- Strong market recovery in this sector as consumer confidence returns
- Still a large number of Mature Narrowbody Engines stored.
- Increase in MRO uptake expected.
- New Generation engines are leading recovery and remain desirable assets.
- Demand is matching up with supply, despite lease rates plateauing.



A320ceo & 737NG

How is the outgoing fleet behaving

CFM56-5B (Airbus A320ceo)

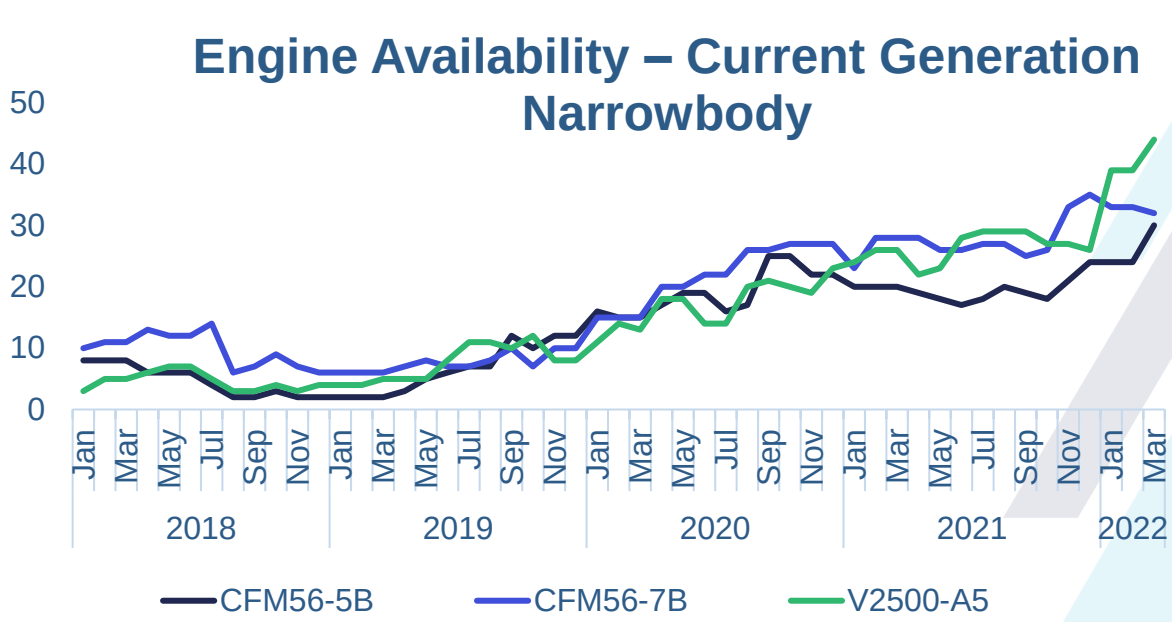
- Slow demand for the 5B, slow recovery in certain markets
- Surplus of USM and Spare Engines saturating the market

CFM56-7B (Boeing 737NG)

- Strong 7B concentration in Domestic Markets
- P2F Conversions ensuring strong longevity
- Still many examples expected to go through their first Shop Visit

V2500-A5 (Airbus A320ceo)

- Airworthiness Directive affecting the HPT
- AD has increased lease demand to ensure limited aircraft downtime
- Fuel burn benefits may play a part into its longevity



Engine	HLMV 2021	HLMV 2022
CFM56-5B4/3	$5,560,000	$5,185,000
CFM56-5B4/P	$4,130,000	$3,880,000
V2527-A5 Select	$5,300,000	$5,300,000
V2527-A5	$4,170,000	$3,950,000
CFM56-7B26E	$7,120,000	$7,100,000
CFM56-7B26/3	$5,530,000	$5,375,000
CFM56-7B26	$4,100,000	$4,000,000

A320neo & 737MAX

How is the NEW fleet behaving

PW1100G (Airbus A320neo)

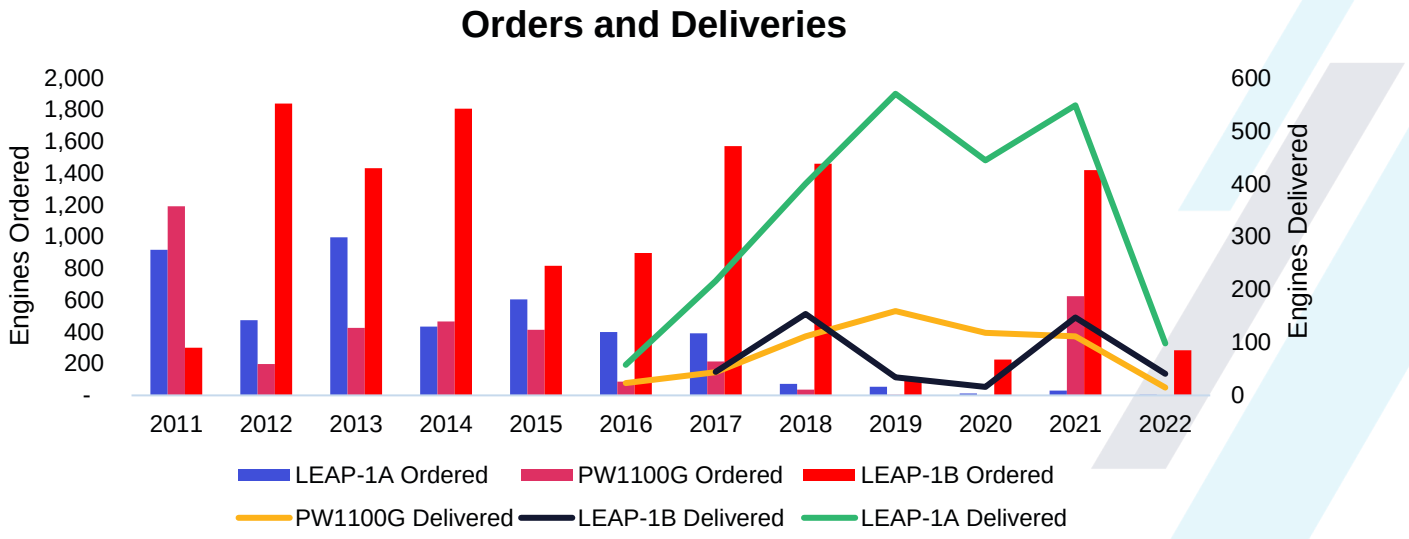
- P&W Announced Advantage Upgrade due to be delivered 2023
- Strong operator base but lags behind LEAP-1A

LEAP-1A (Airbus A320neo)

- Remains a liquid asset
- Strong backlog, but new orders thinning

LEAP-1B (Boeing 737 MAX)

- Positive re entry into service
- Value position- business as normal

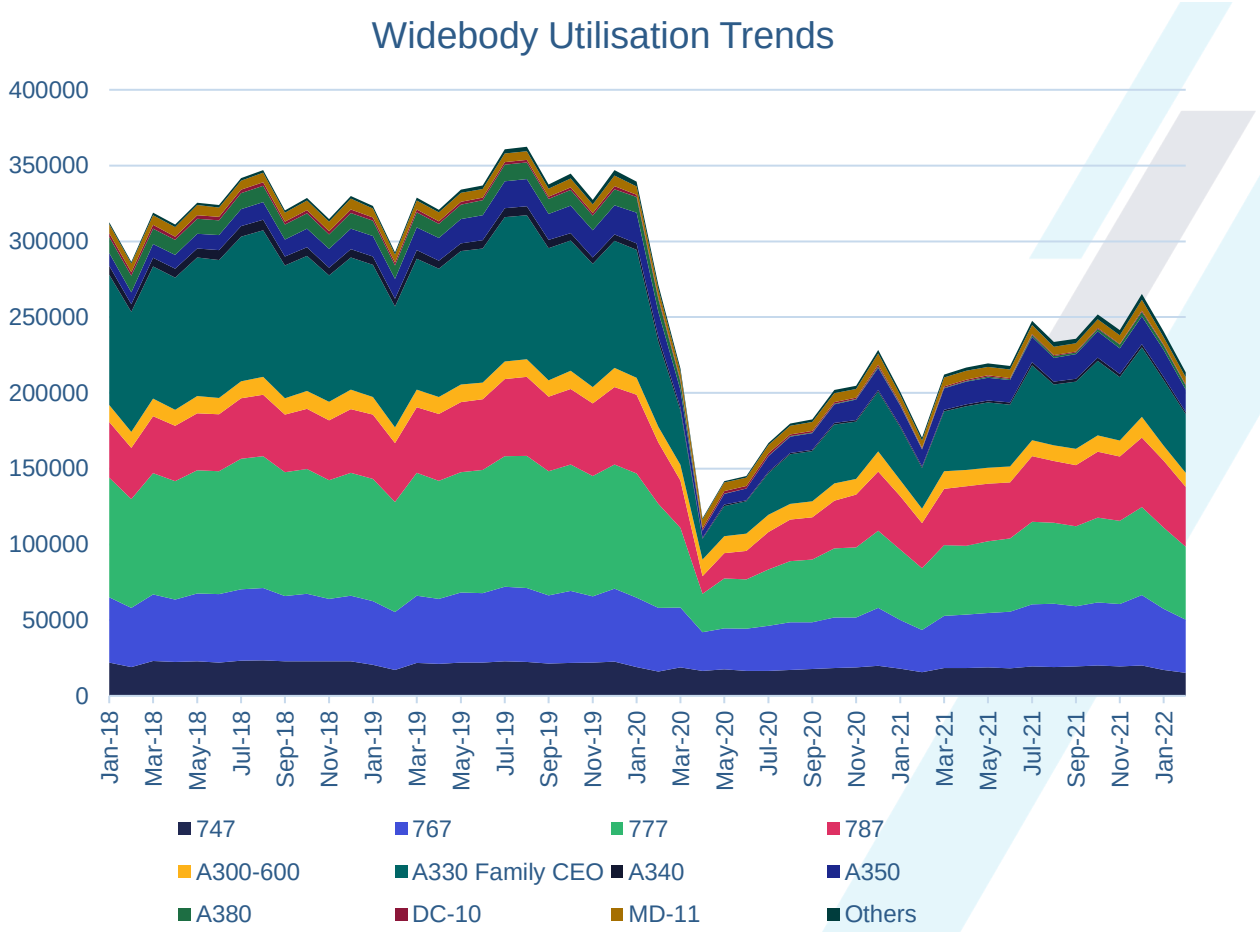


Engine	HLMV 2021	HLMV 2022
LEAP-1A26	$9,650,000	$9,735,000
PW1127G	$9,500,000	$9,500,000
LEAP-1B27	$9,900,000	$10,000,000

Trends and Market breakdown

Widebody Outlook and health

- Utilisation is slowly improving
- SLB activity picking up
- Niche lessor base – limited focus
- Strong orderbooks, top tier operators and less competition
- Mature passenger engines cause concern
- Opportunistic deals could well be on the table.
- ESG/Fuel cost may well drive mature values down further over time



Widebody Market

Soft and recovery still lagging behind

Mature fleets struggling to recover

- Trent 900 / GP7000 – A380
- GE90-110/115 – 777 ‘Growth’ Fleet
- GE90-7/8/9 / Trent 800 / PW4000-112 – Mature 777 ‘Classic’ fleet
- Trent 700/CF6-80E/PW4000-100 – A330

Freighters the Exception

- CF6-80C2/PW4000-94 – Freighter 747/767 aircraft

New Gen Engines sought after is SLBs

- Trent XWB – A350
- Trent 7000 – A330neo
- GEnx-1B/Trent 1000 – 787

Engine Model	HLMV 2021	HLMV 2022
GP7200	$ 4,940,000	$ 3,725,000
GE90-94B	$ 5,680,000	$ 3,100,000
GE90-115BL1	$ 11,320,000	$ 10,000,000
CF6-80C2B1F	$ 1,590,000	$ 2,025,000
PW4062	$ 2,340,000	$ 2,750,000

Engine Model	HLMV 2021	HLMV 2022
Trent XWB-84	$ 22,610,000	$ 22,925,000
Trent 7000-72	$ 18,930,000	$ 19,100,000
Genx-1B74/75 PIP 2	$ 19,890,000	$ 19,890,000
Trent 1000-J TEN	$ 19,210,000	$ 19,380,000

Removal from Service, Retirement, Part Out

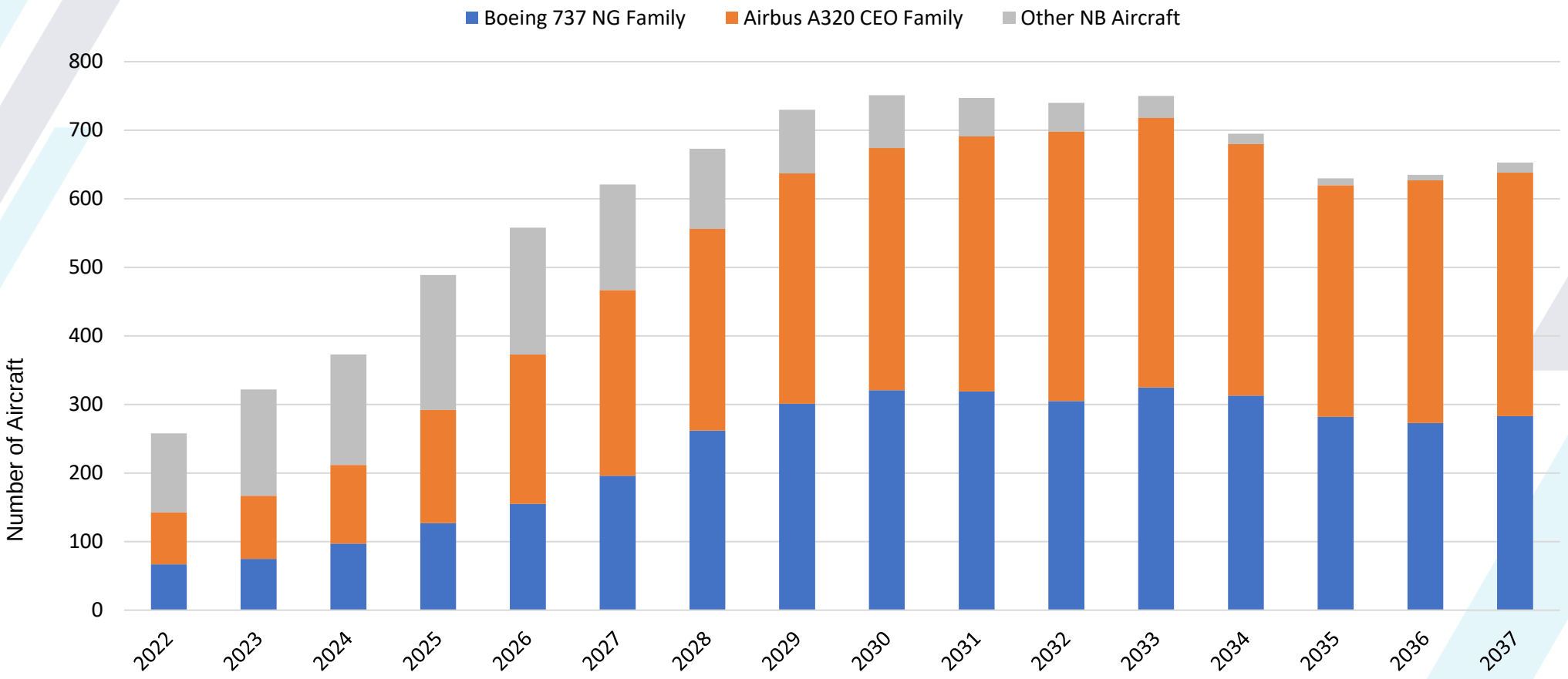
- Economic Environment
- Increased operating costs: Fuel, Maintenance
- Reduced Demand – temporary storage
- Regulatory, required mods
- Age / Damage
- Fleet planning / new aircraft delivery

Removal from service

- Return to service cost exceed operational benefits
- Operating cost no longer viable
- Increased likelihood of future costs / failure
- Part-out/disassembly proceeds, reduce in utilization/time
- Ownership cost and owners' financial position

Part Out / Decommission

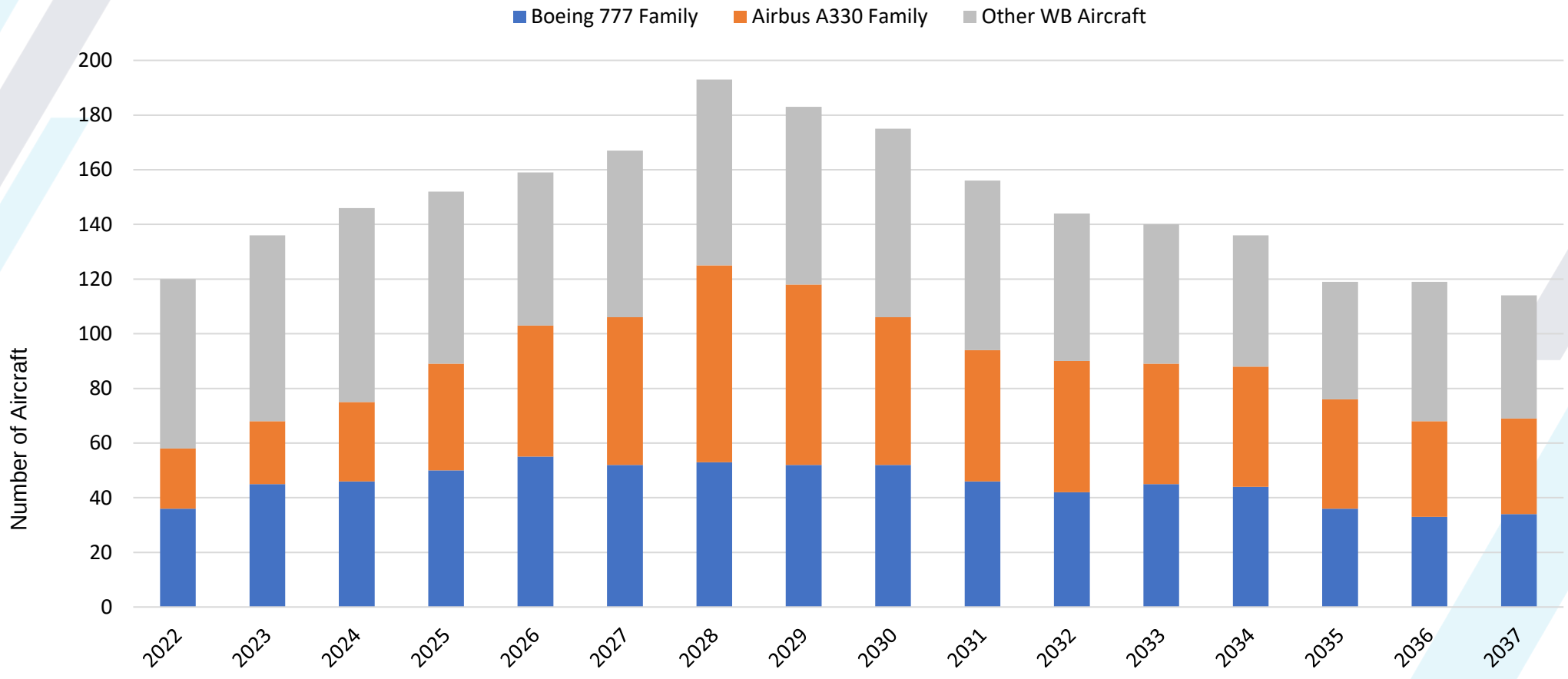
Narrowbody retirements to peak by 2030s. The impact of aircraft's long-term storage persists



Source: IBA Insight

Airbus A320-200 will lead the retirement trend in the narrowbody sector, closely followed by 737-800

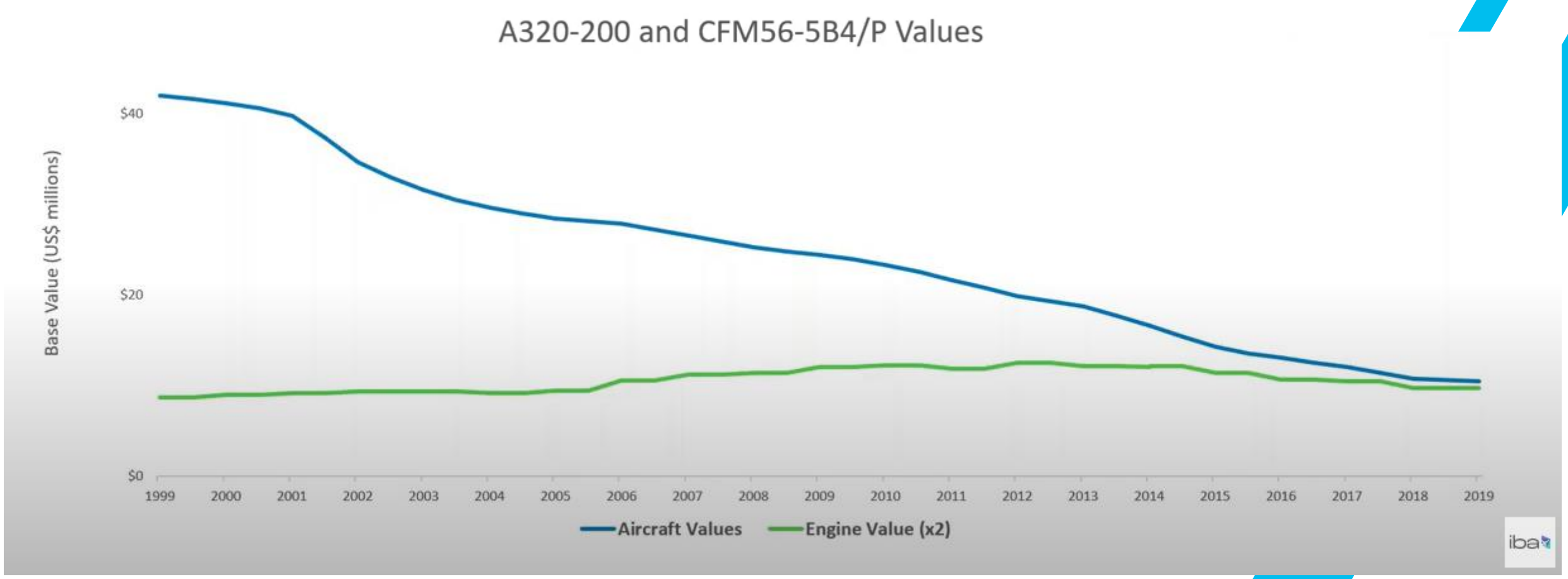
Widebody Retirements expected to peak in 5-6 years



Source: IBA Insight

Quad-engine widebodies retiring fastest, but A330ceo will become the predominant retirement type by 2030s

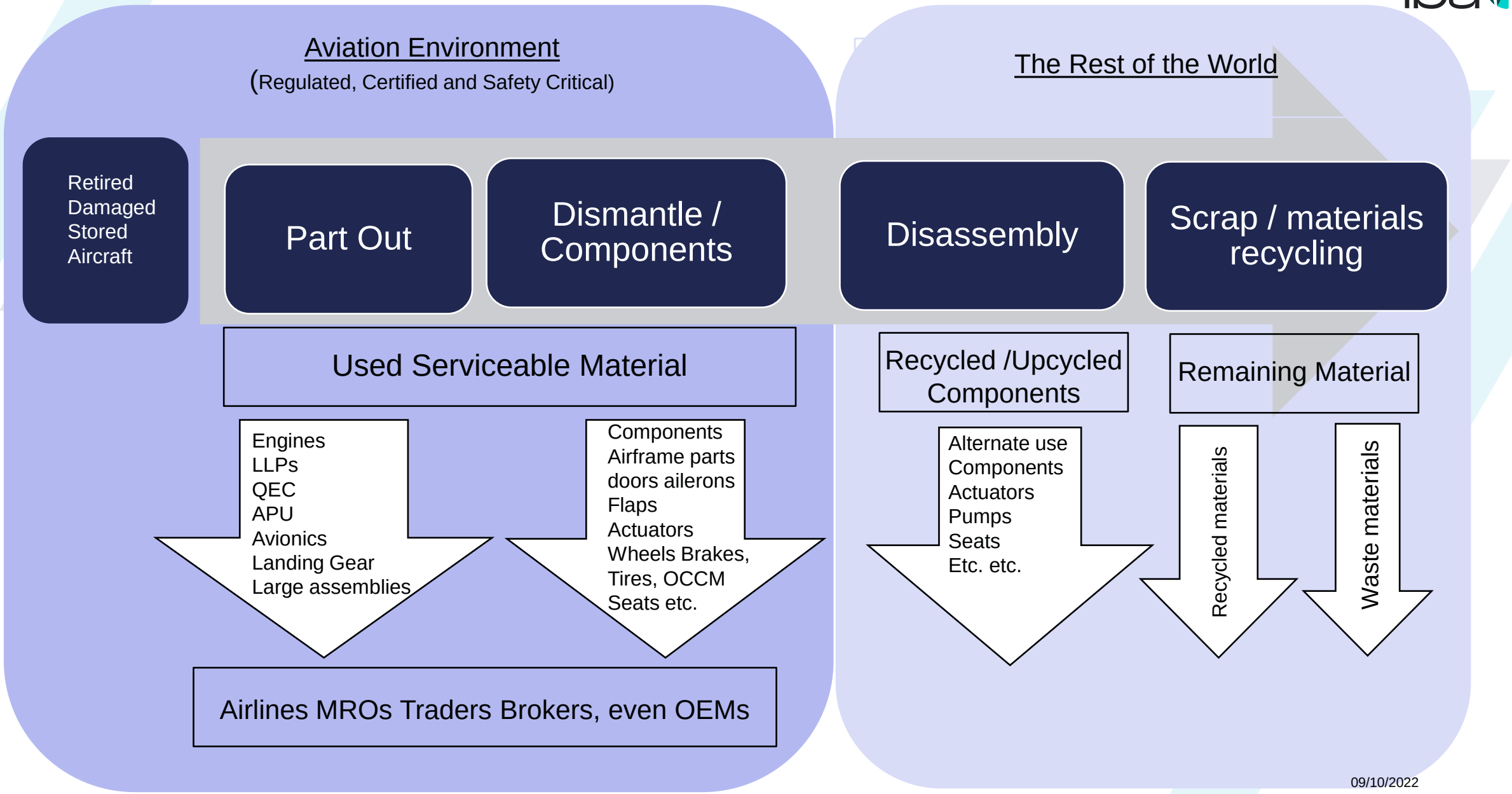
The majority of value in a part out aircraft in the engines



Engine Market Drivers

- The List Goes On
  - Supply and Demand
  - Host Aircraft Populations
  - Order Book and New Orders
  - Retirement Profiles
  - Diversity of Operator Base
  - Fuel Price
  - Cost of Capital
  - Long Term Reliability Issues – Particularly for Dual Source Aircraft
  - Shop Visit Demand
  - Spare Engine Levels
  - Dual or Sole Source Engines
  - Maintenance Demand/Capacity in the Market
  - Niche Areas = Short Term opportunities
  - Level of OEM Aftermarket Control
  - Active Trading Aftermarkets
  - High OEM Escalation = Good Value Retention and Residual Values
  - Cross Platform Commonality
  - New aircraft
  - Engine variant upgrades

Part Out, Disassembly, Scrap



Aircraft Part-Out

Valuation Method

Valuation Methodology

IBA Insights – desktop values
Emerging Trends
Depreciation profile

market research - Transaction data points for various aircraft and market intelligence, cost inputs, mathematics, and judgement

Salvage Value / Part Out Value is the actual or estimated selling price of aircraft, engine, and or major assembly based on value of marketable parts and components that could be salvaged for re-use on other aircraft or engines.

Scrap or part out value is primarily driven by the maintenance condition

Major assemblies – maintenance adjusted

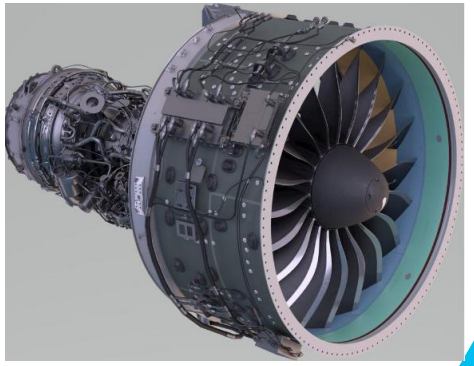
Replacement Costs

Scrap material resale

Major Assemblies – Maintenance Adjustments

The maintenance interval	**Calendar, FH or FC**
TSLSV / CSLSV	
Shop Visit	**$**
Overhaul	**$**
Replacement	**$**
Runout scrap	**$**

Supply & Demand +/- premium or discount for used value



Engines – Maintenance Adjustments - ERP

Engine Performance Restoration – Greentime
Life Limited Parts
Runout Scrap - Core & QEC

Greentime Value

Life Remaining
Maintenance Interval x Shop Visit Cost

but consider min LLP tradeable value, typically, FC required to complete MTBO. CM56 est. 5,000 FC

Greentime Value
FCR 11,500 remaining (approx. 2 years) x Engine Lease Rate $30k/mth = $720,000

LLP stack with Ave. 14,000 FCR x CLP = LLP tradeable value c $950,000

Engines – Maintenance Adjustments - LLPs

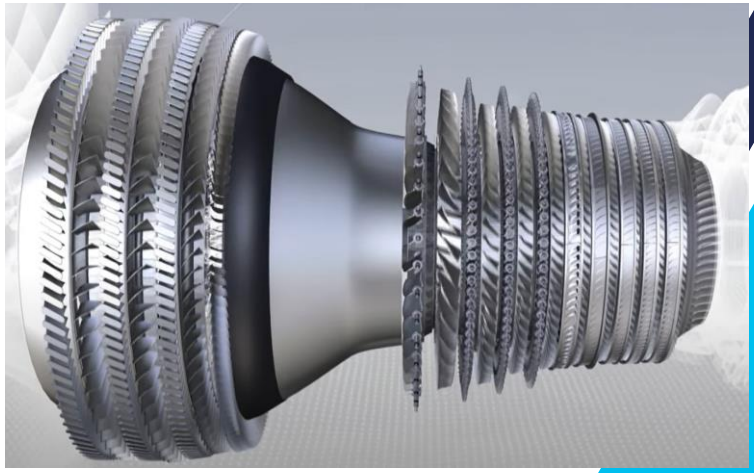
Chapter 5 life limit – Total Flight Cycle Used = FCR multiplied by Tradable Value per Flight Cycle

e.g. 30,000 – 8,341 = FCR 21,659 multiplied by Value per Flight Cycle

Current List Price $ / Chapter 5 life limit

Subject to minimum FCR - CFM56 typically 5,000

Adjustment for environment, supply & demand



To maintain ESG credentials the Aviation industry must find new technology to drive future dismantling

- Quoted from Aircraft Fleet Recycling Association

•Not all end-of-service aircraft owners are considering environmental risks and performance when looking for a Disassembly provider. Responsible aircraft end-of-life management is important for improving industry performance (aviation safety – proper removal of parts -, parts identification and inventory control, environmental impact), and to increase commercial value for end-of-service aircraft.

•Furthermore, it is estimated that by 2030, retired aircraft will feature high percentages of composites such as carbon fibre and other emerging materials. Both aircraft manufacturers and disassembly and recycling plants are currently actively developing strategies and processes to optimise the reuse and recyclability potential of these new materials.

•AFRA members face further challenges related to the transport of waste, to the complexity of REACH legislation and to the national implementation of end of waste legislation, which can result in a fragmented approach at EU level.

•In addition, awareness needs to be further built in the industry of the importance of proper aircraft end-of-service management, so that the environment, worker safety, etc. are taken into account and not only the of the disassembly/recycling project.

Thank you

For more information please contact: marketing@iba.aero