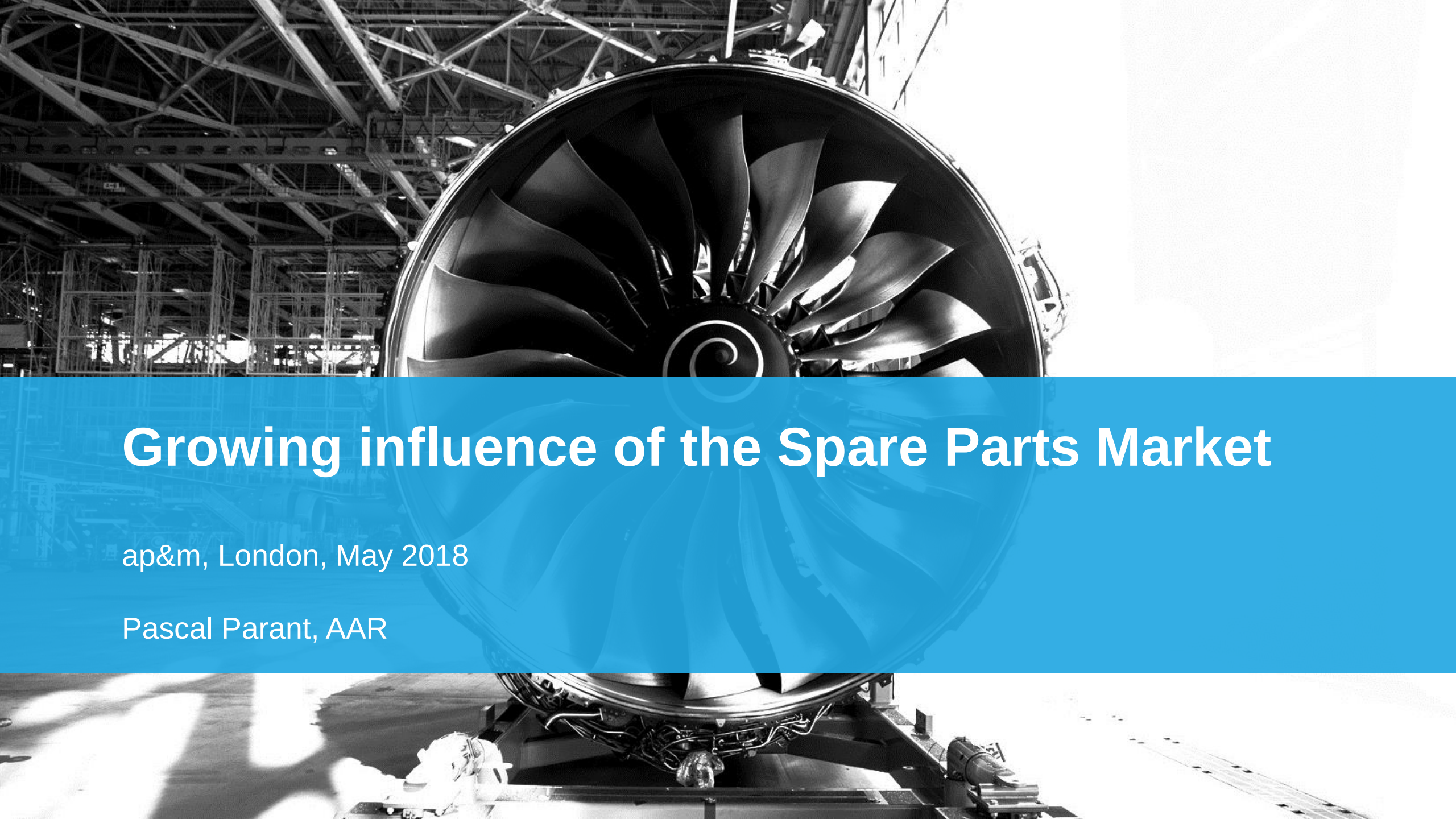


Growing influence of the Spare Parts Market

ap&m, London, May 2018

Pascal Parant, AAR

What is driving the strong performance in spare parts supply?

Three phases:

1. Entry in Services: 0 to 10 years of program; mainly or only new
2. Maturation: 10 to 40 years of program; growing offer and demand on USM that keeps attractive returns
3. Sunset: 40+ years of program; market flowed with USM material; prices declining, until arriving to niche player market

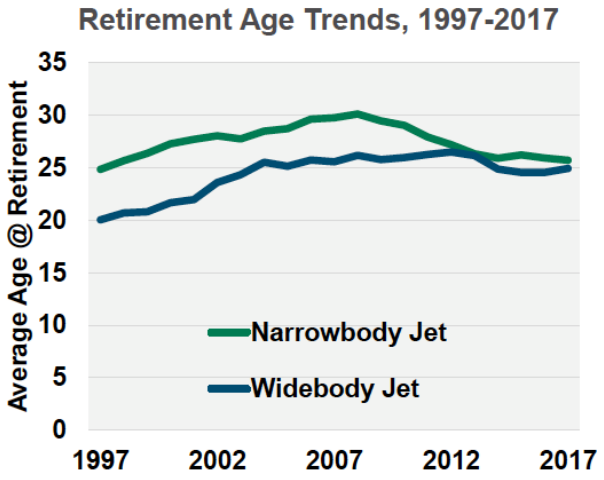
→ Average life of an aircraft of 25 years or more → generates huge MRO activity → drives to **cost optimization**!

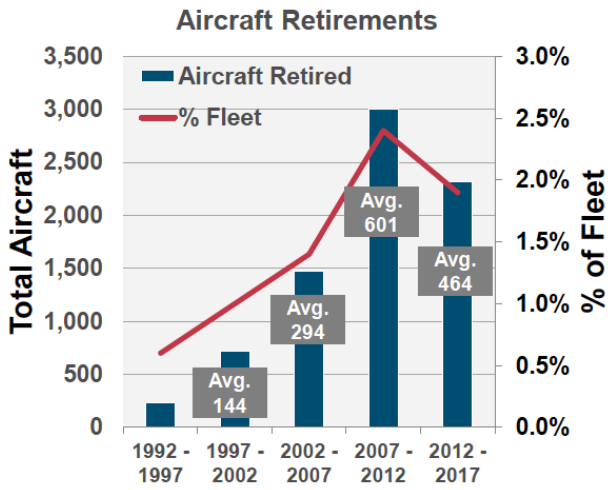
→ Growing pains of new generation aircraft and engines keep current generation flying.

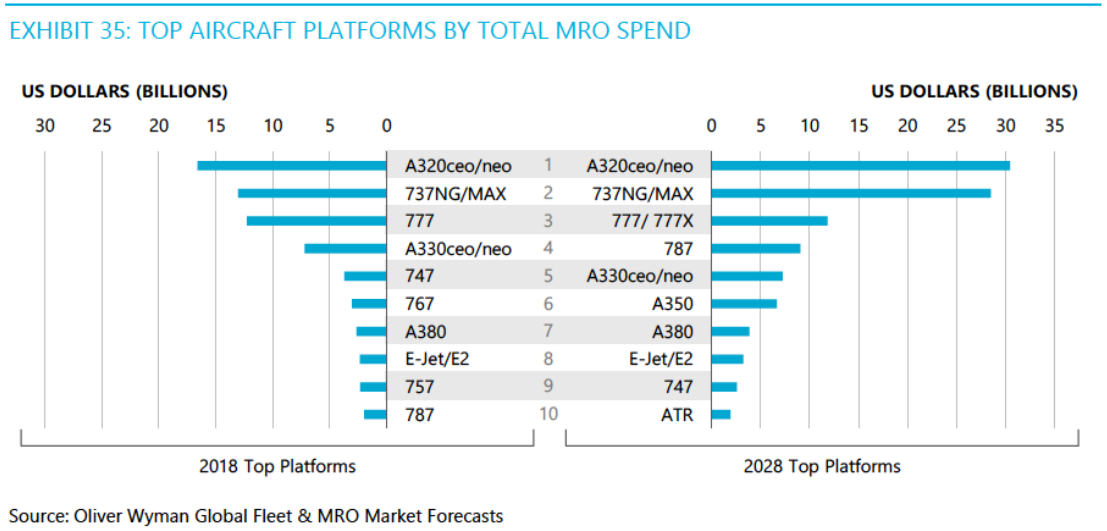
"An aircraft is an assembly of spare parts flying in close formation together"

- **David P. Storch**, Chairman & CEO of AAR

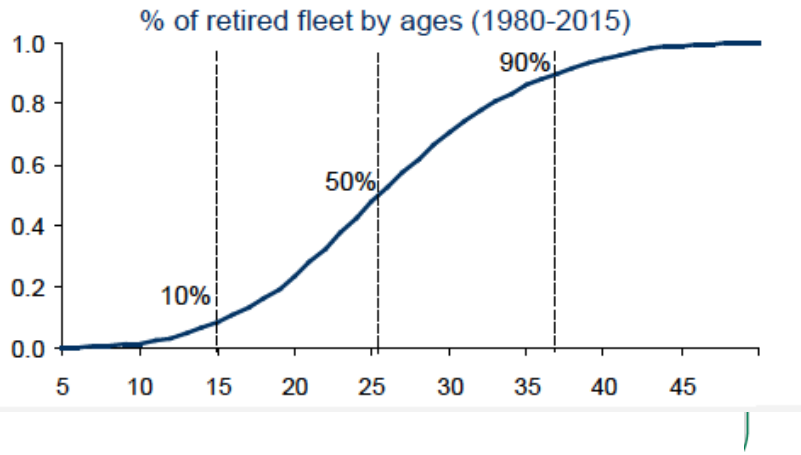
What is driving the strong performance in spare parts supply?

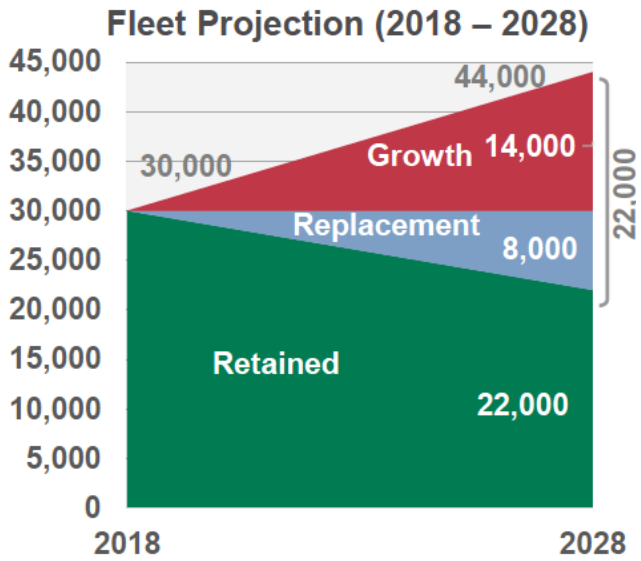


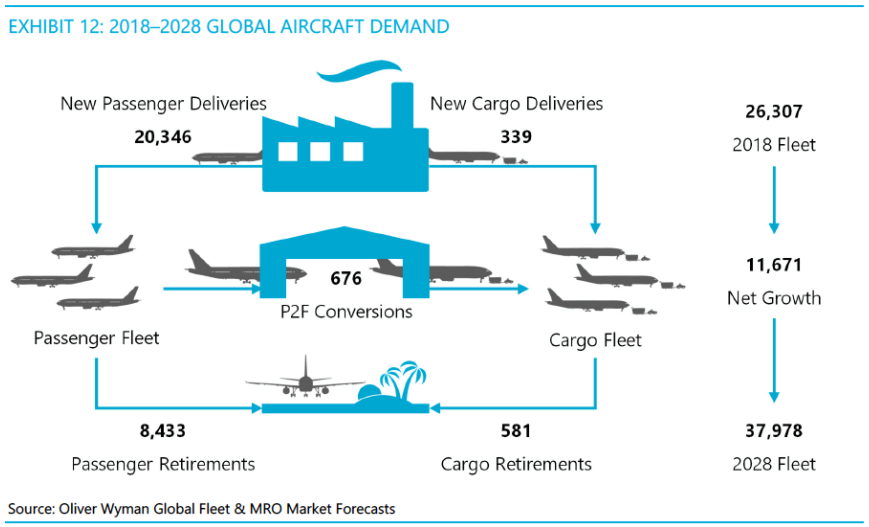




Source: Oliver Wyman Global Fleet & MRO Market Forecasts



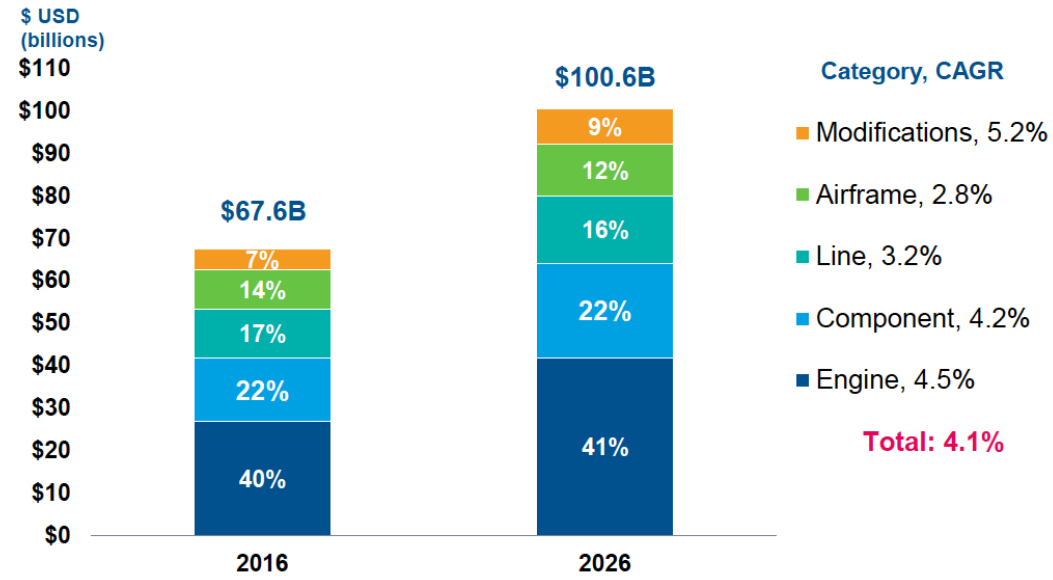




Source: Oliver Wyman Global Fleet & MRO Market Forecasts

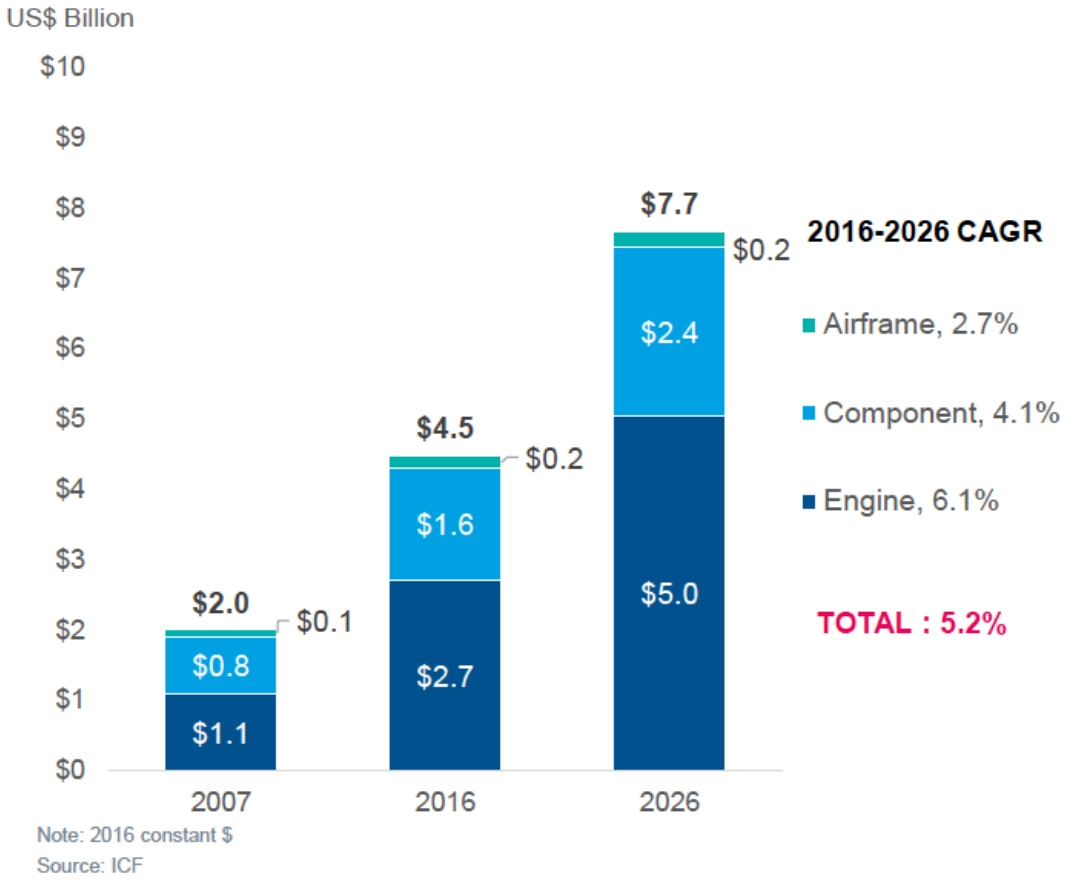
What is driving the strong performance in spare parts supply?

10 YEAR GLOBAL COMMERCIAL AIR TRANSPORT MRO DEMAND (CONSTANT 2016 US$)



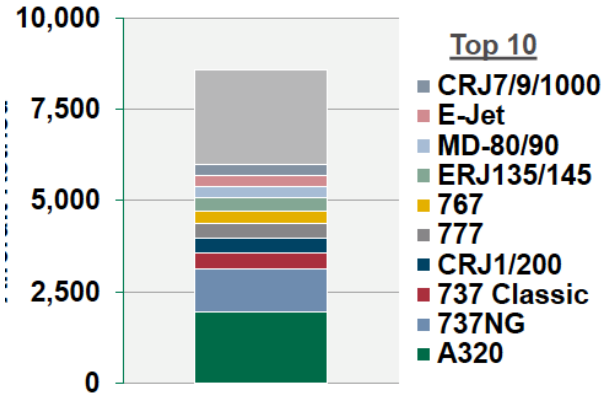
Source: ICF Analysis, CAPA 2016

AIR TRANSPORT SURPLUS MARKET FORECAST

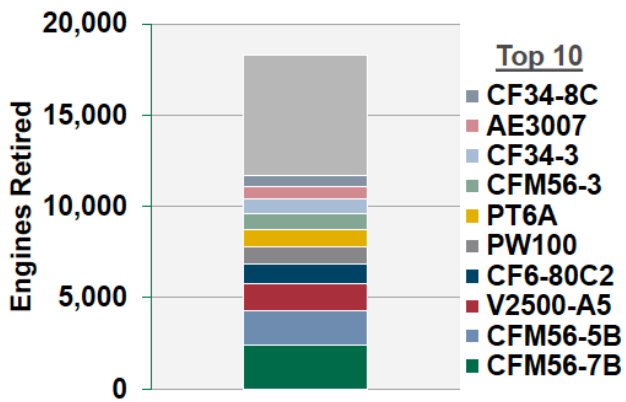


Note: 2016 constant $
Source: ICF

Aircraft Retirement Forecast, 2018-2028



Engine Retirement Forecast, 2018-2028



Are we witnessing the market peak of USM? Will we see a more volatile future?

Demand

- Strong demand from airlines to reduce cost and consolidate suppliers
- Strong demand from service providers to reduce cost. New airframers entrant like Boeing, UTAS, …
- Growing pains on Next Gen are keeping CG and OG products alive
- Strong demand for EIS of Next-Gen product

Offer

- Retired aircraft have strong communality with current one. Good feedstock to satisfy demand
- Repair or replace solution, green time management, module management for engine
- Livestock available, but problems are also slowing down retirement process
- Unfortunately, new-only solution for the next five years minimum, and no “odd” new aircraft (A318 & 737-600 types)

Are we witnessing the market peak of USM? Will we see a more volatile future?

Risks

- High demand of CG flyers to counter balance growing pain problems of next-gen aircraft
- Price of potential tear down aircraft at peak
- Return condition with component age matching aircraft one
- Engines using LLPs before EGT driving issues on rebuild standard

Opportunities

- Enough inventory to support life extension
- End of life reserve management by lessor will feed T/D market
- Stimulation of USM to match return condition
- Green time management, LLPs management policy creating opportunities

Are we witnessing the market peak of USM? Will we see a more volatile future?

Based on forecast, USM will continue to have a healthy development, driven by strong passenger demand. Aircraft are retired at the average age of 24 years, creating livestock for other aircraft still in operation.

Airframers are even proposing USM solutions to keep their products competitive. We also notice tension between airframers and OEMs.

But **outside factors** may influence the development rate of USM:

- **Oil price**: Drives oldest and less fuel efficient aircraft to bone yard. Will affect tail end of USM (747, 767, 737-3/4/5, early gen A320 and 737NGs)
- **Macro economic**: Interest rate evolution, dollar strengthening, alarmist debt ratio
- **World environment:** *Iran, Korea, Syria, Russia, China, … A lot of instability around the world that may impact the aviation industry*

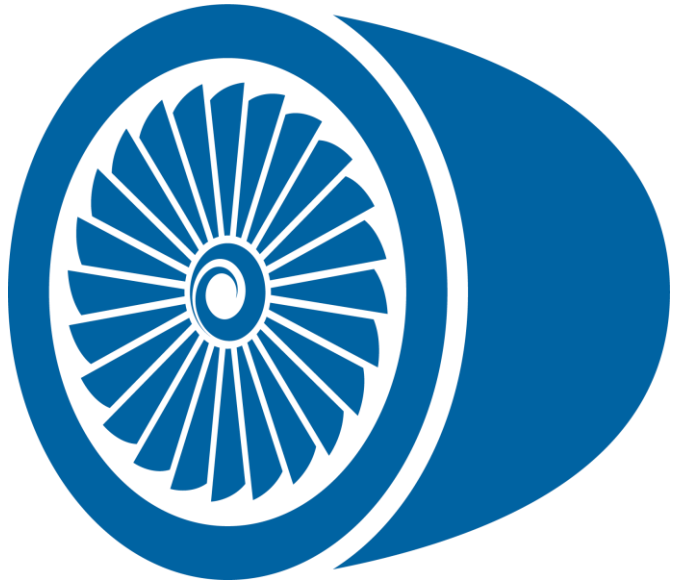
Tail end of USM will continue to see natural erosion. Mainstream of USM (737NG, A320s, A330, 777...) should continue to develop as more aircraft will be retired. Next-Gen will be for next five years minimum. Only external factors can have strong impact on growth of USM.

What is the predicted landscape for the new generation of engines?

Predominant situation of OEMs on maintenance agreement:

- 80% of GTF under contract
- 50% of LEAP under contract (CFM offers 18 MRO choice, LEAP TBA this year)
- Over 99% of Trent NG (1000, XWB, 7000) under contract
- 50% on GENex with 7 MRO choice; too early to define GE9X
- NB contract average 12 years

MRO choice will define USM strategy and marketability



Increase reliability on wing expected to exceed current gen engine:

- Increased build up specs (10kCR mini)
- Stub life close to zero value below certain threshold
- Increased scrapped rate due to high MTBR

Green time management will be intermediate solution to USM

→ Need at least 10-15 years to see USM model developing on “friendly” engines

Do disruptive manufacturing techniques threaten the buoyancy of the current market?

Engines:

- Disruptive manufacturing technics still high tech, requesting heavy equipment
- OEMs not open to put on market drawings and manufacturing secrets
- IP protection

Electronics:

- Not the most open to disruptive technics by nature

Electromechanical:

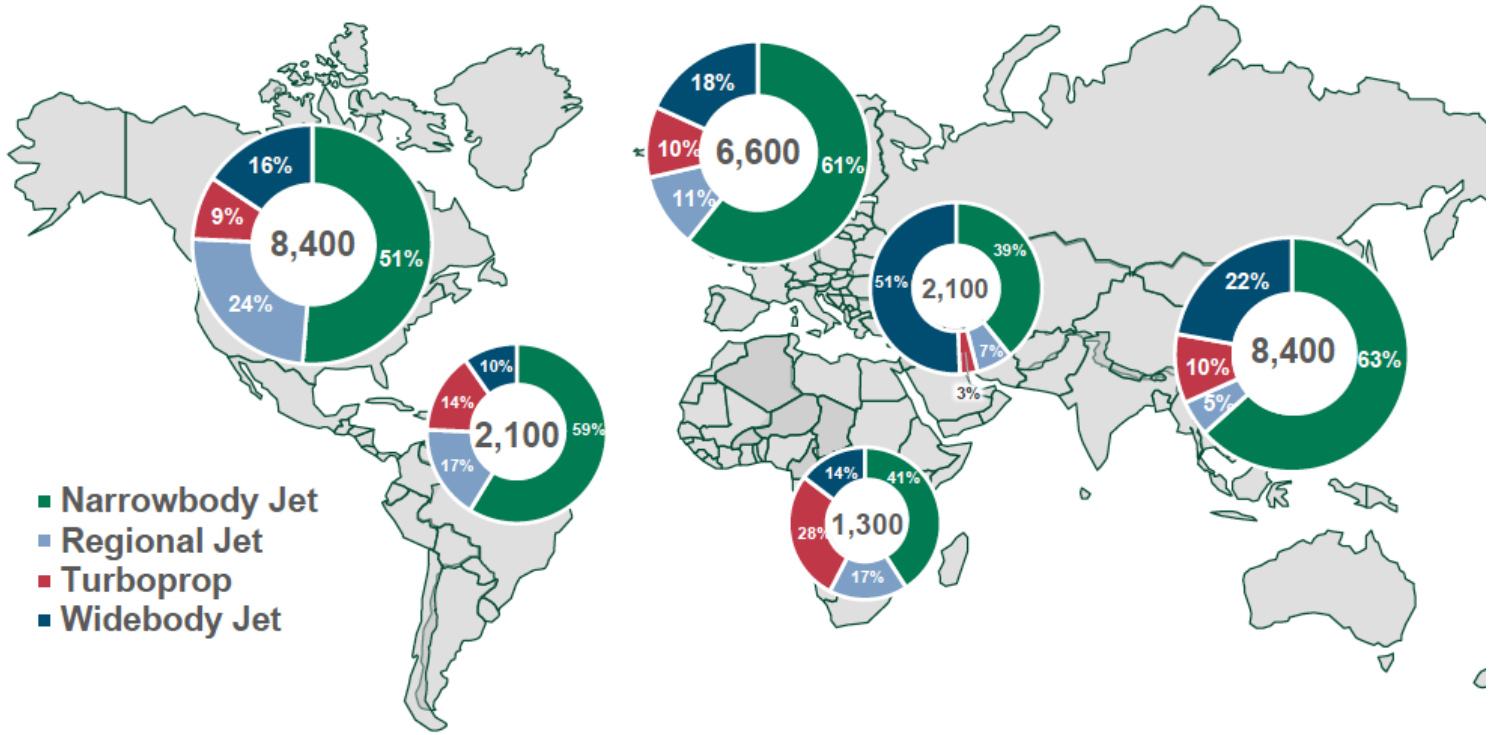
- Main opportunities
  - IP protection
  - Can reduce lead-time, not price

Cabin:

- Main opportunity, with plastic/composite
- Less dynamic USM segment

Will the market shift eastward with regional fleet growth?

Today's commercial air transport fleet consists of approximately 28,000 aircraft, with Asia Pacific equaling North America in size

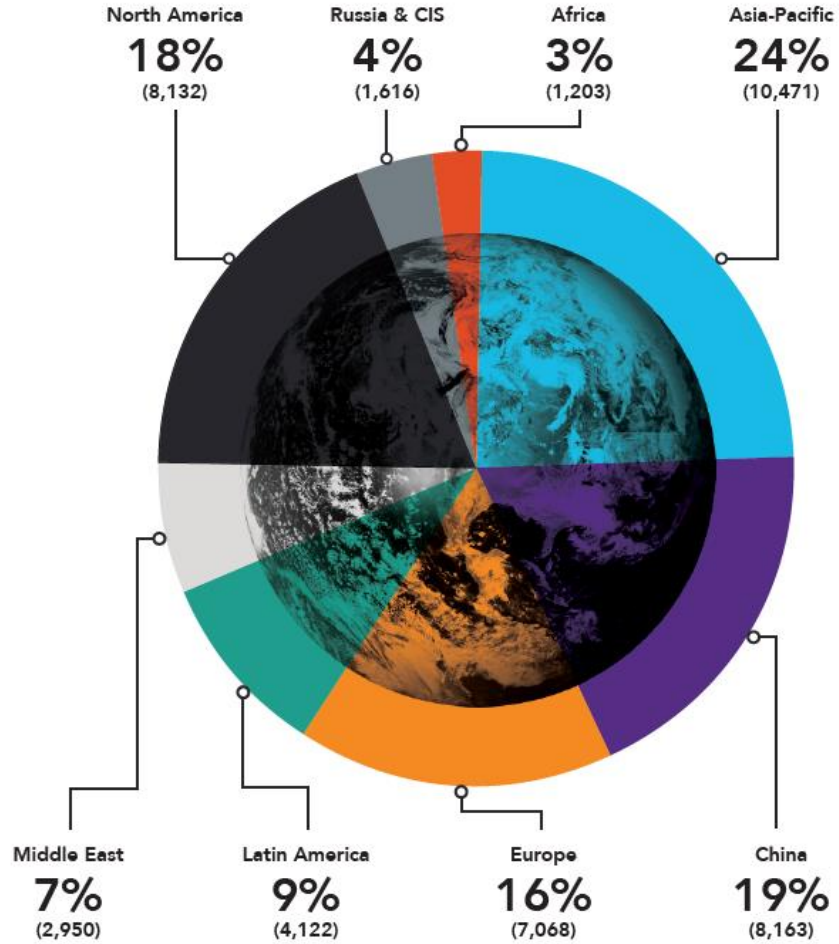


ALTON AVIATION CONSULTANCY

Source: CAPA, Alton analysis

flightglobal.com

Forecast 2017-2036 Deliveries by Region



Will the market shift eastward with regional fleet growth?

- Fleet mainly new in Asia, with OEMs locking up long-term contracts on engine and components (Airbus, CFM, RR, …) limiting USM opportunities
- Tentative development at the local USM market by some Chinese Lessor: CALC
- Different approach depending of countries on USM

AAR Capabilities

MRO Services

- Airframe
- Landing gear
- Component repair
- Engineering

Parts Supply

- Serviceable and OEM factory-new parts
- Parts sale, exchange, loan and lease
- Engine solutions
- Aircraft teardown, sales and leasing
- OEM services: supply/inventory management, warehouse/logistics, sales support/market access, and government contract management

Integrated Solutions

- Total fleet services for commercial and government
- Flight-hour support
- Consumables and expendables aggregator
- Contractor logistics support (CLS)
- Performance-based logistics (PBL)

Manufacturing

- Composites: Interior structures, flat panels, aerostructures
- Mobility Systems: Air cargo containers (ISU®) and pallets; rapidly-deployable mobile tactical shelters; SPACEMAX® shelters; integrated command control centers (C4)

Aviation Services

Source of information for graphics

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Thank you 謝謝 Gracias ขอขอบคุณ
Merci תודה Takk شكرا لكم Obrigado
Danke sehr спасибо Grazie Mahalo

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