THE MRO MARKET & KEY TRENDS

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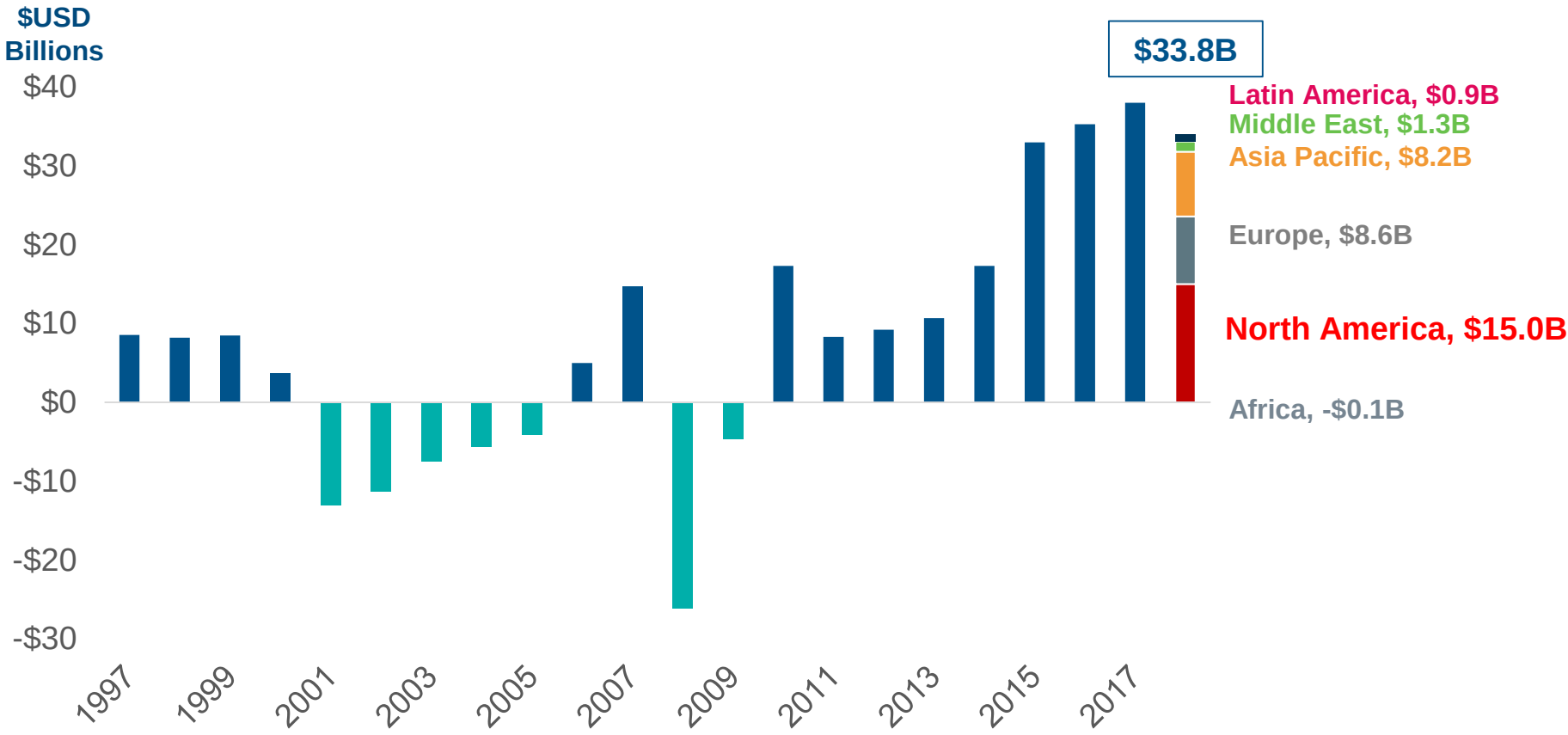
Today's Agenda

1. Industry Context
2. MRO Market
3. Trends to watch

Industry Context

Global airline industry achieved a record profitability of $38B USD in 2017, which is forecast to decrease to $33.8B in 2018

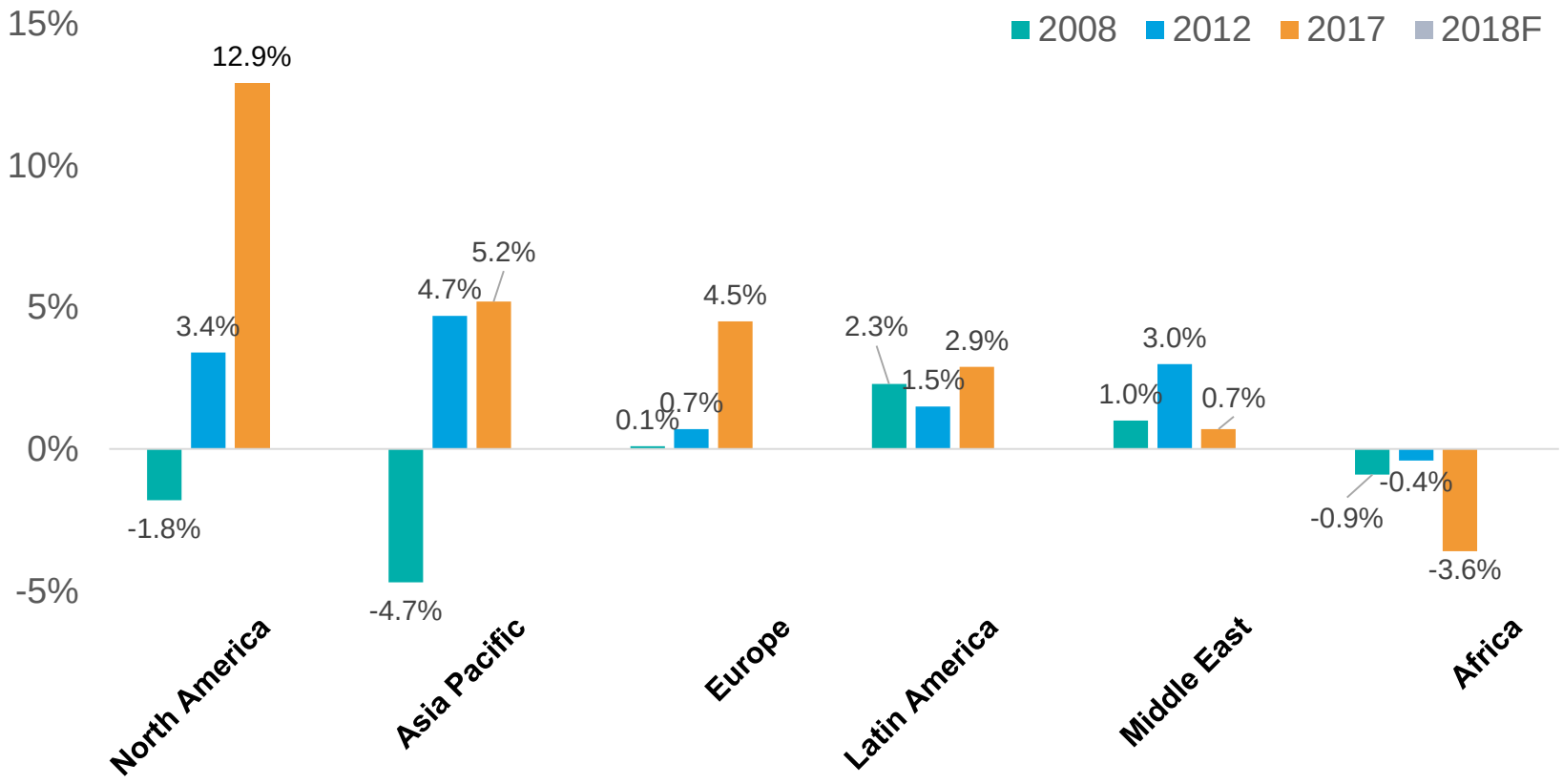
GLOBAL AIRLINE PROFITABILITY, 1998 – 2018F



Source: IATA/ ICF Analysis

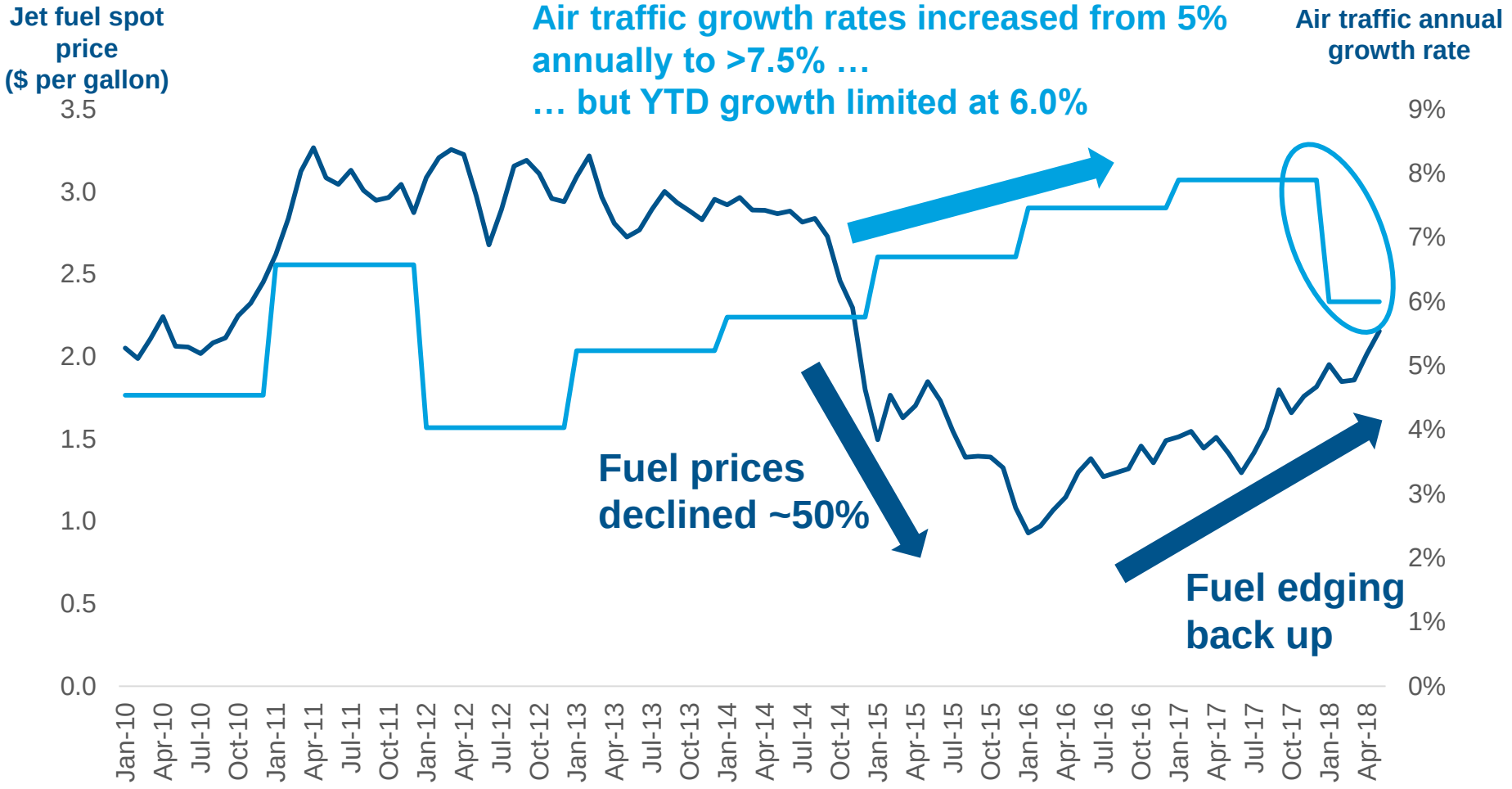
…but many airlines continue to struggle though North America has been a bright spot and was leading the way in 2017

GLOBAL AIRLINE EBIT MARGIN BY REGION



Source: IATA/ ICF Analysis

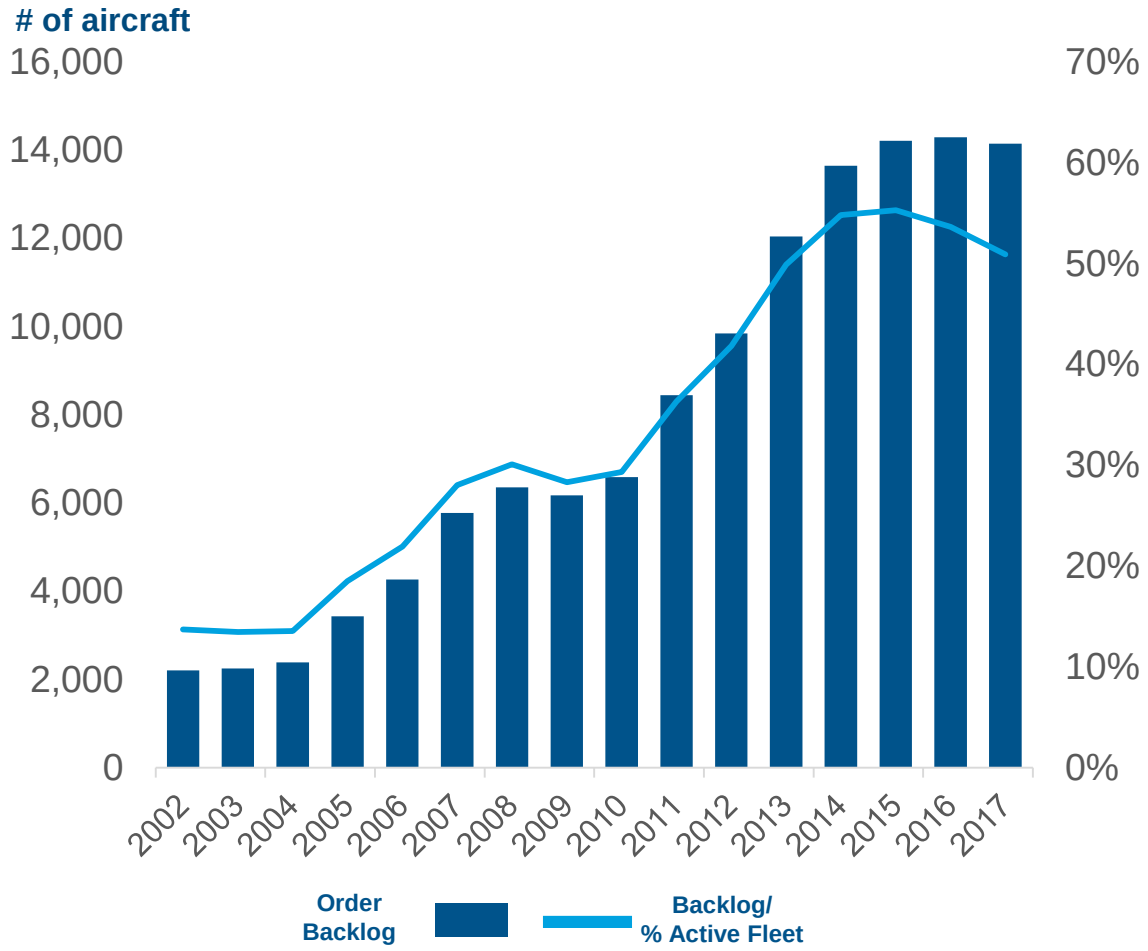
Traffic growth driven by low fuel prices is slowly reversing, as 2018 has shown YTD growth of ~6.0%



Source: EIA; IATA

Commercial aircraft OEM production backlog remains at historical highs

COMMERCIAL AIRCRAFT OEM PRODUCTION BACKLOG



Source: CAPA, ICF Analysis

DRIVERS OF OEM BACKLOG

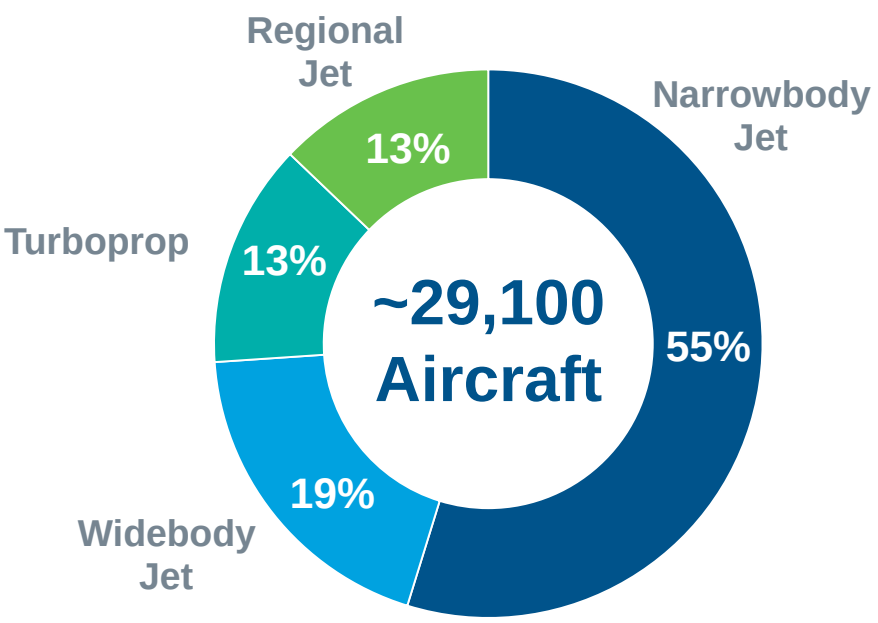
- Backlog more than doubled between 2010 and 2014, driven by:
  - Emerging market growth
  - Very low interest rates and plentiful capital
  - High oil and commodity prices
  - Introduction of new technology aircraft/engines
- In 2017, total backlog decreased for the first time since 2009 as deliveries ramp-up and orders slowdown

MRO Market

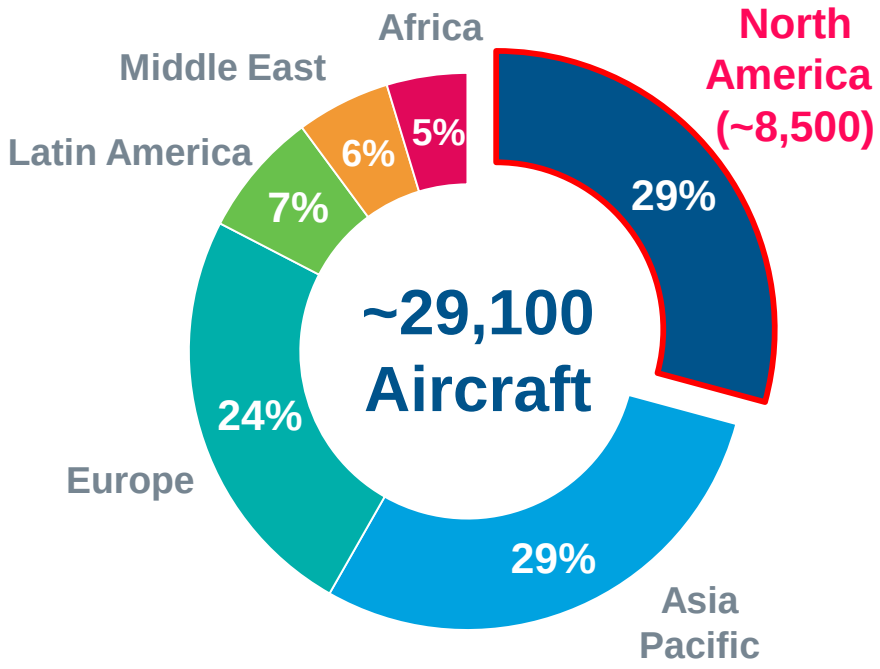
The current commercial air transport fleet consists of ~29,100 aircraft; ~8,500 are located in North America

2017 GLOBAL COMMERCIAL AIR TRANSPORT FLEET

BY AIRCRAFT TYPE



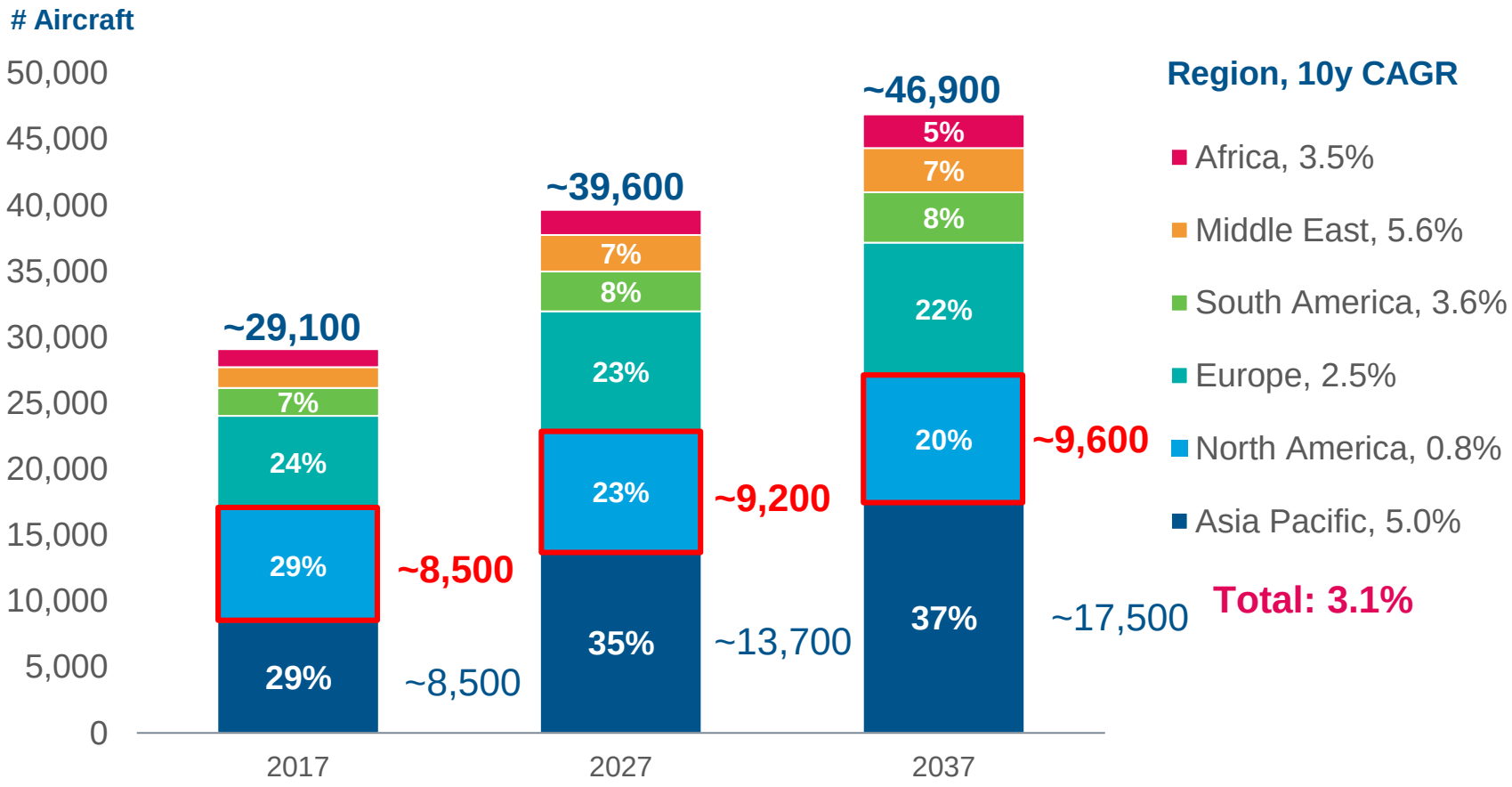
BY GLOBAL REGION



Source: ICF Analysis: CAPA 2017

The combination of strong air travel demand and the need to replace ageing aircraft will drive fleet growth at a healthy 3.1% p.a.

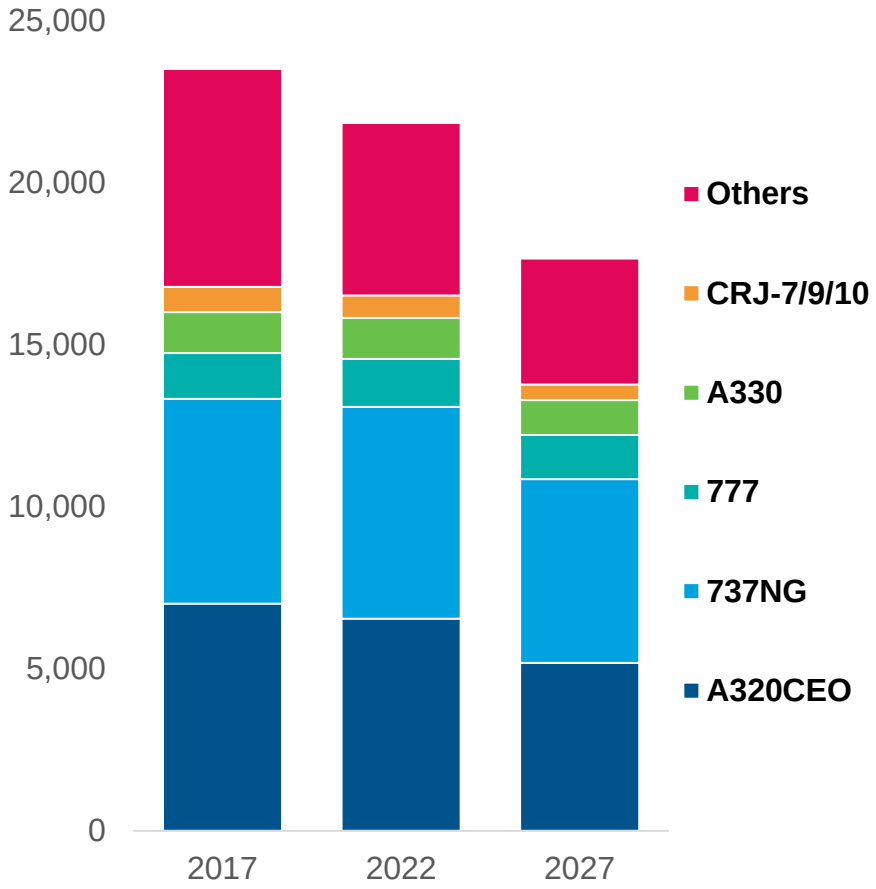
20 YEAR GLOBAL AIR TRANSPORT FLEET GROWTH



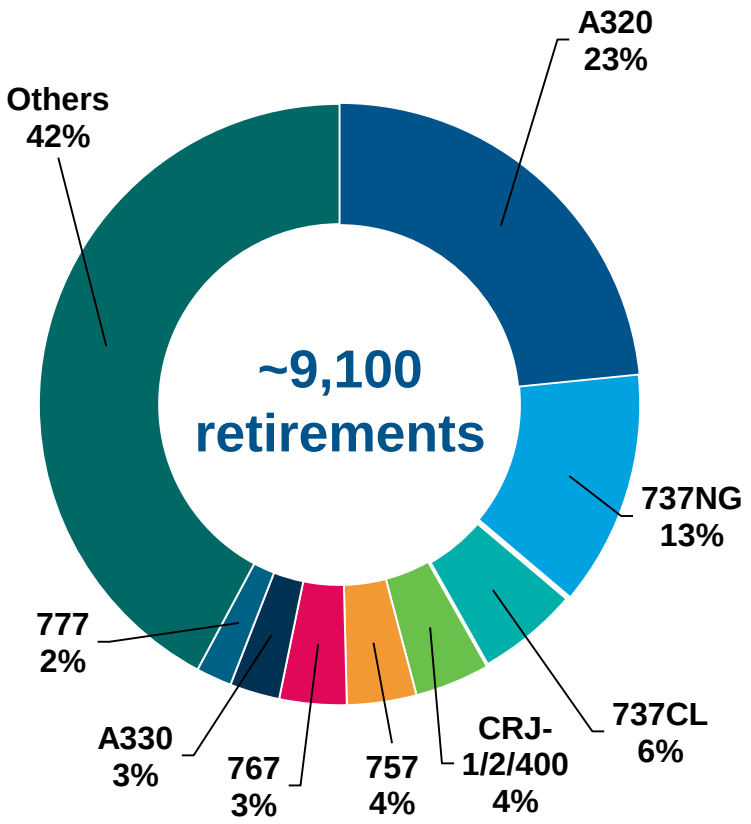
Source: ICF Analysis: CAPA 2017

As old and maturing fleets gradually decline, ~9,100 aircraft are expected to retire

MATURE AIRCRAFT FLEET BY PLATFORM (# OF AIRCRAFT)



AIRCRAFT RETIREMENTS (2017-2026)

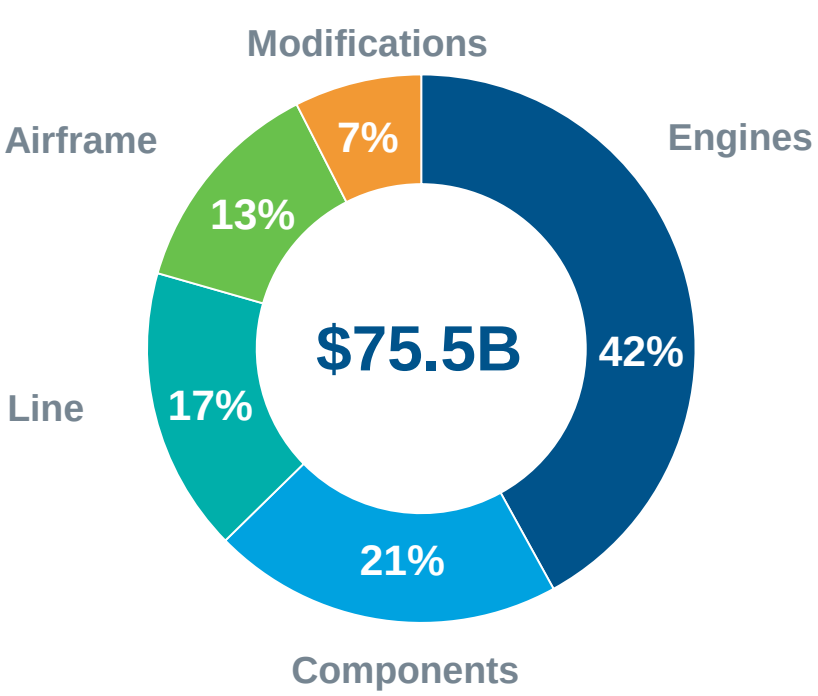


Source: ICF

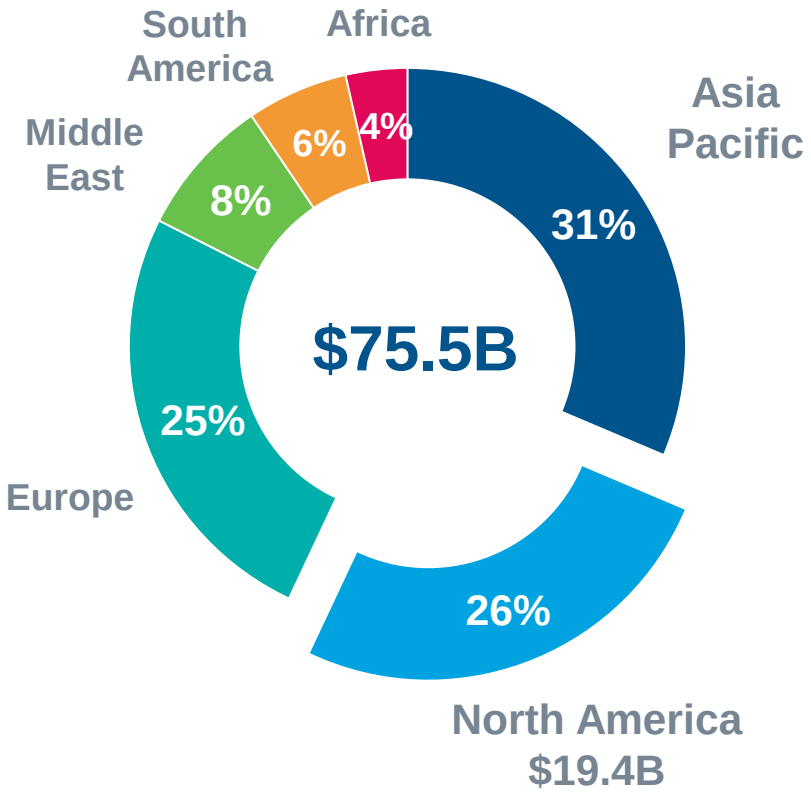
2017 commercial air transport MRO demand is $75.5B; Asia is now larger than North America and Europe in market size

2017 COMMERCIAL AIR TRANSPORT GLOBAL MRO DEMAND

BY MRO SEGMENT



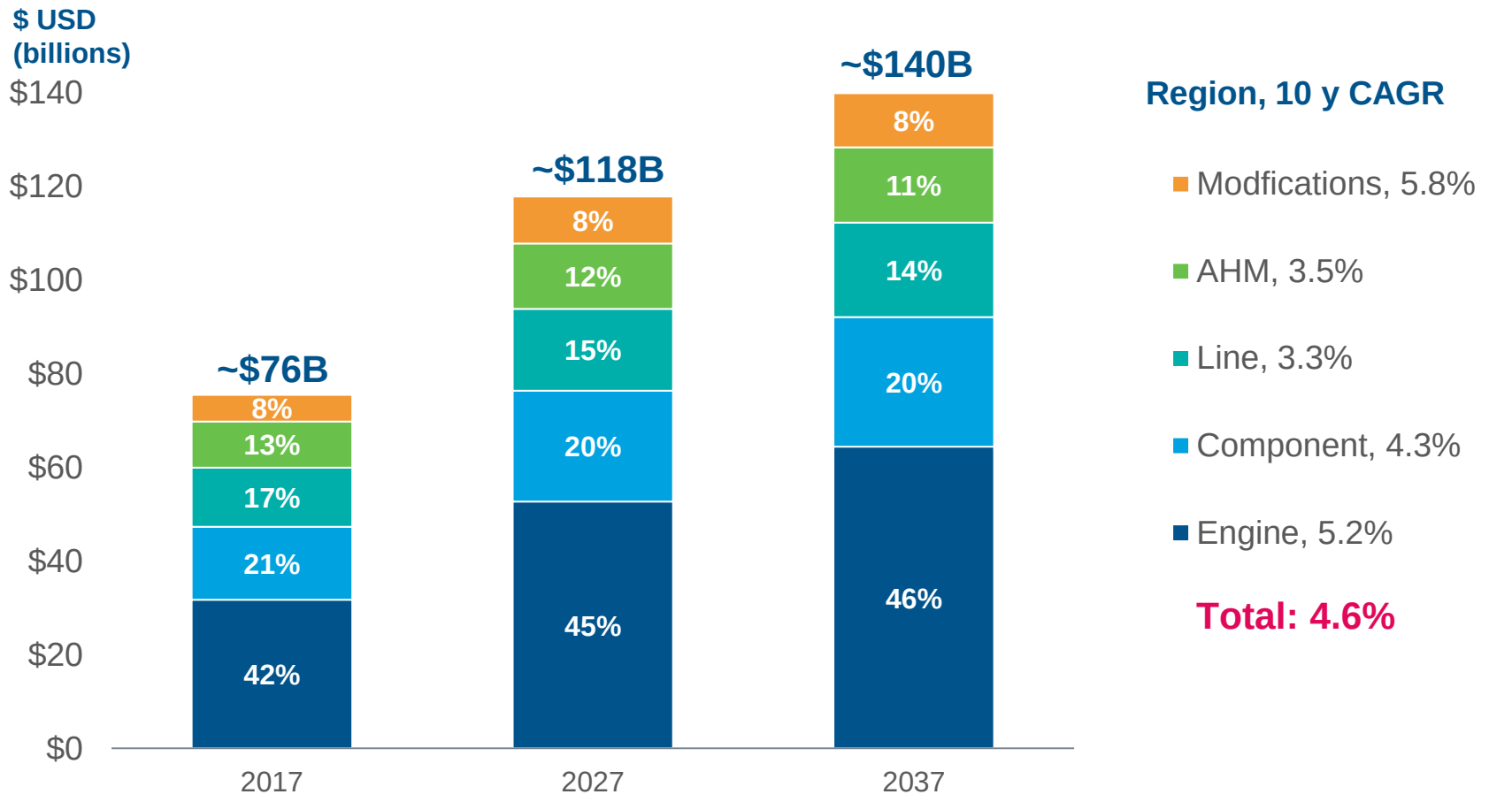
BY GLOBAL REGION



Source: ICF Analysis: CAPA 2017

The global MRO market is expected to grow by 4.6% per annum to ~$118B by 2027

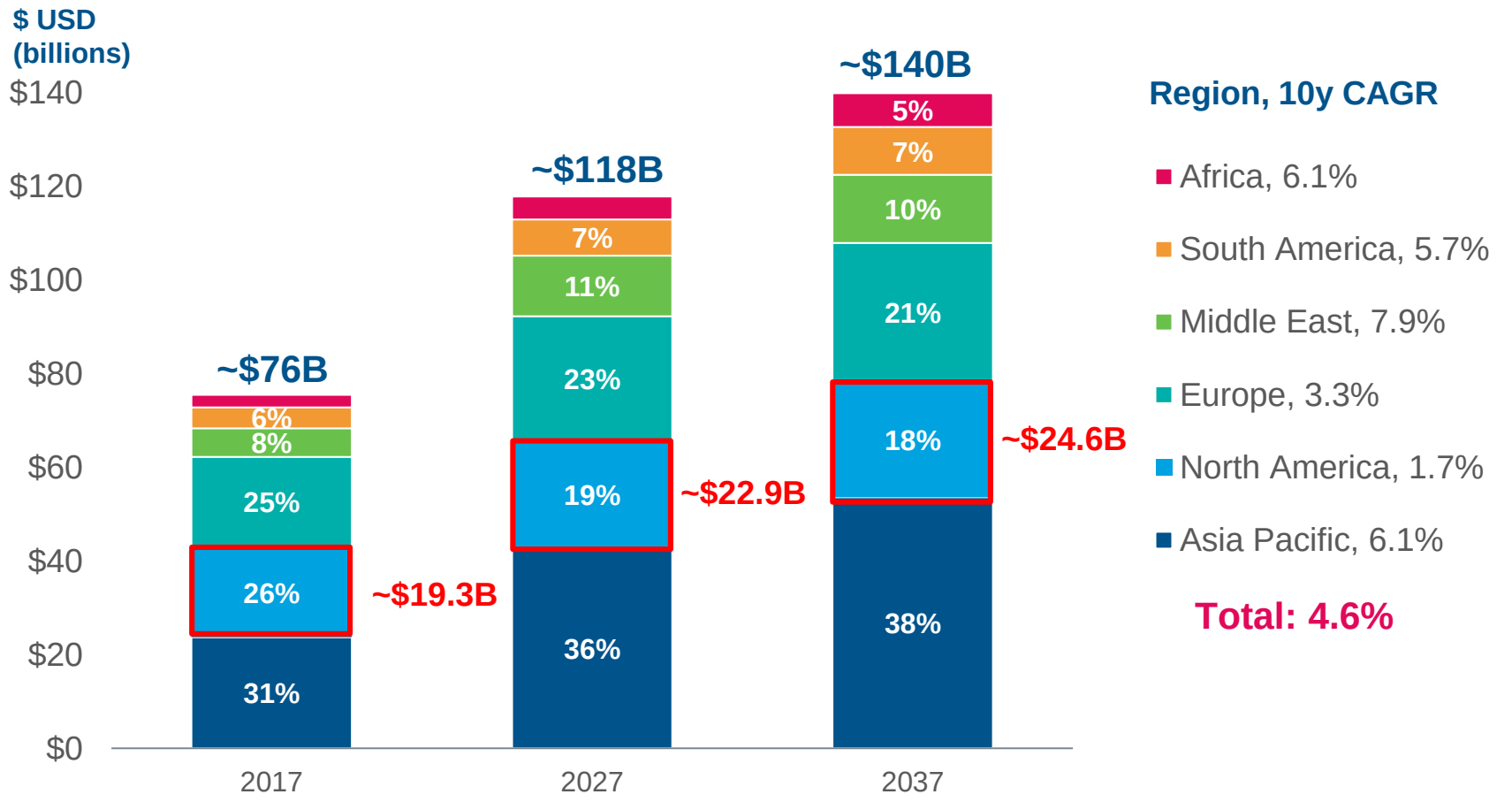
20 YEAR GLOBAL COMMERCIAL AIR TRANSPORT MRO DEMAND



Source: ICF Analysis: CAPA 2017, 2017 constant $

Asia continues to grow strongly and will generate 38% of MRO demand by 2037…

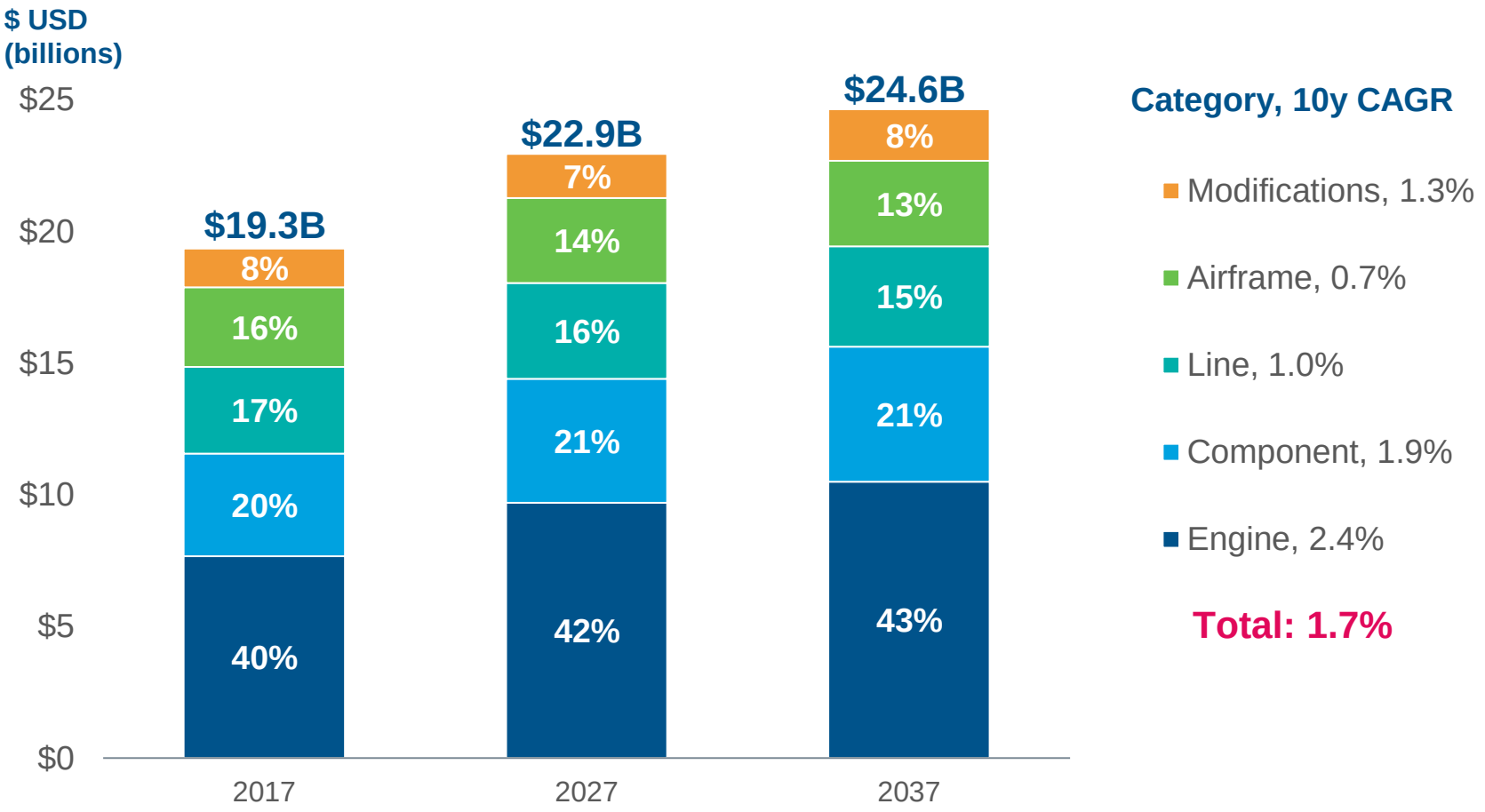
20 YEAR GLOBAL COMMERCIAL AIR TRANSPORT MRO DEMAND



Source: ICF Analysis: CAPA 2017, 2017 constant $

North American MRO spend exhibits marginal growth, increasing by 1.7% per annum to $22.9B by 2027

20 YEAR NORTH AMERICAN COMMERCIAL AIR TRANSPORT MRO DEMAND



Source: ICF Analysis: CAPA 2017, 2017 constant $

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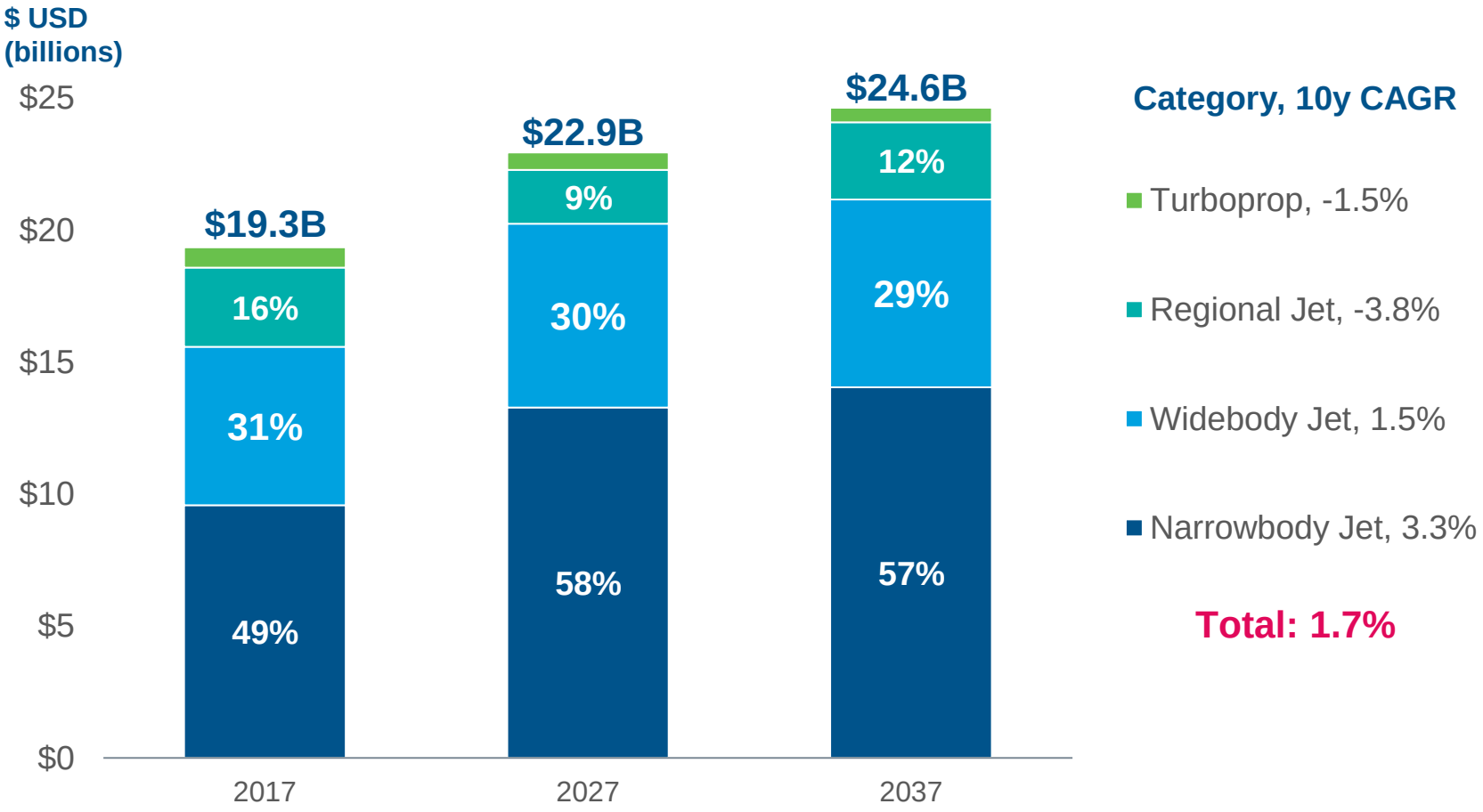


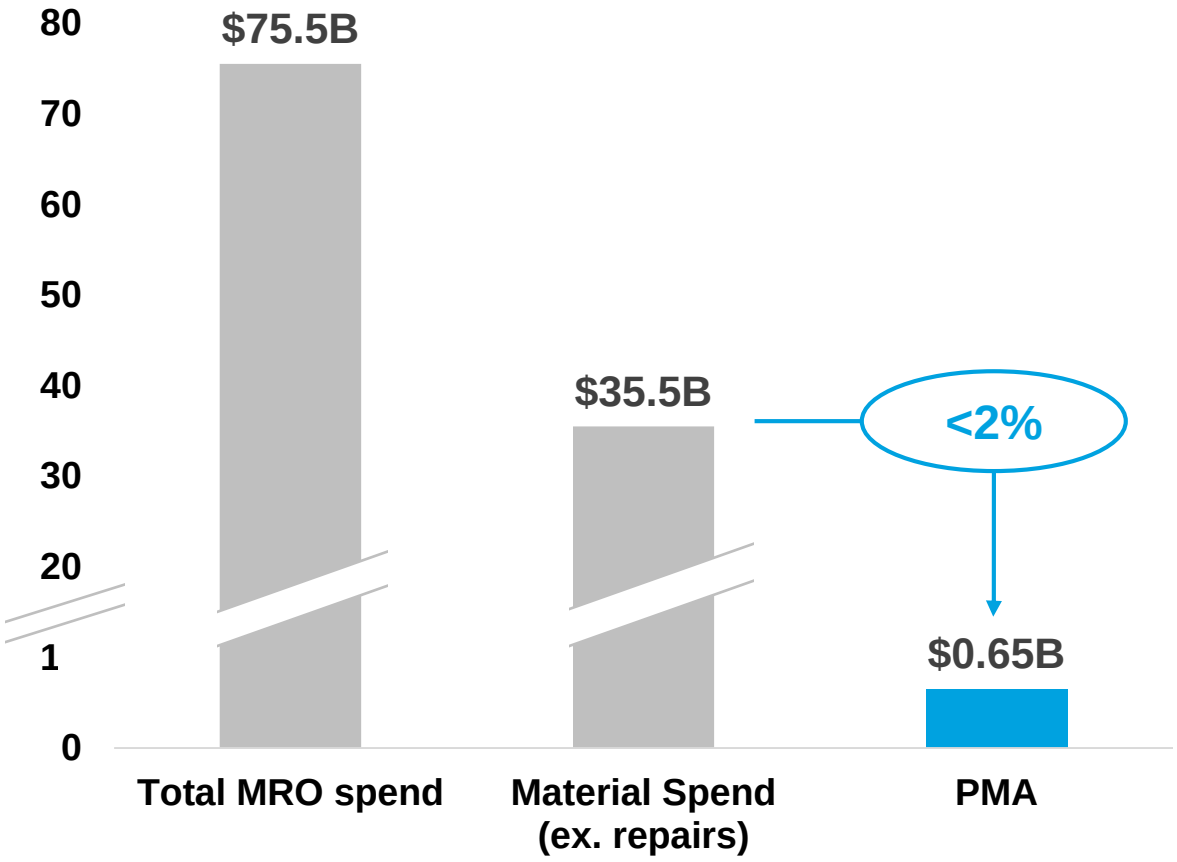
Source: ICF Analysis: CAPA 2017, 2017 constant $

Trends To Watch

PMA Outlook

PMA represents less than 2% of MRO material spend

PMA DEMAND VERSUS TOTAL MRO AND MATERIAL SPEND ($B)



Source: ICF

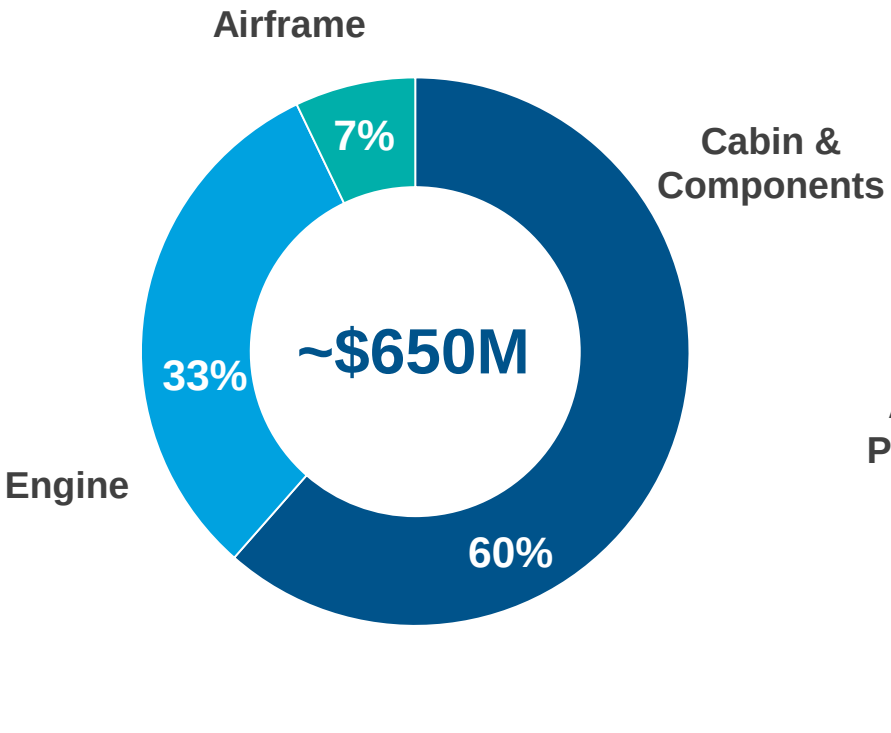
OBSERVATIONS

- The air transport industry spends ~$31.5B on aftermarket material, including OEM material, surplus parts and PMA alternatives
- PMA remains a small part of the market at just under 2% of total

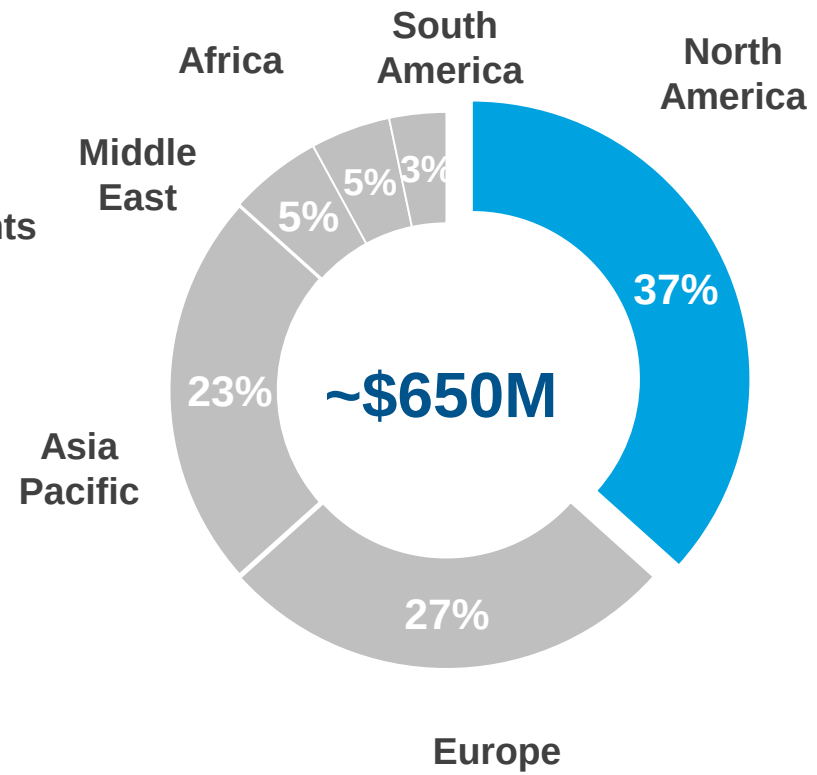
2017 commercial air transport PMA demand was ~$650M, N. America and Europe remain the key regions

2017 COMMERCIAL AIR TRANSPORT GLOBAL PMA DEMAND

BY MRO SEGMENT



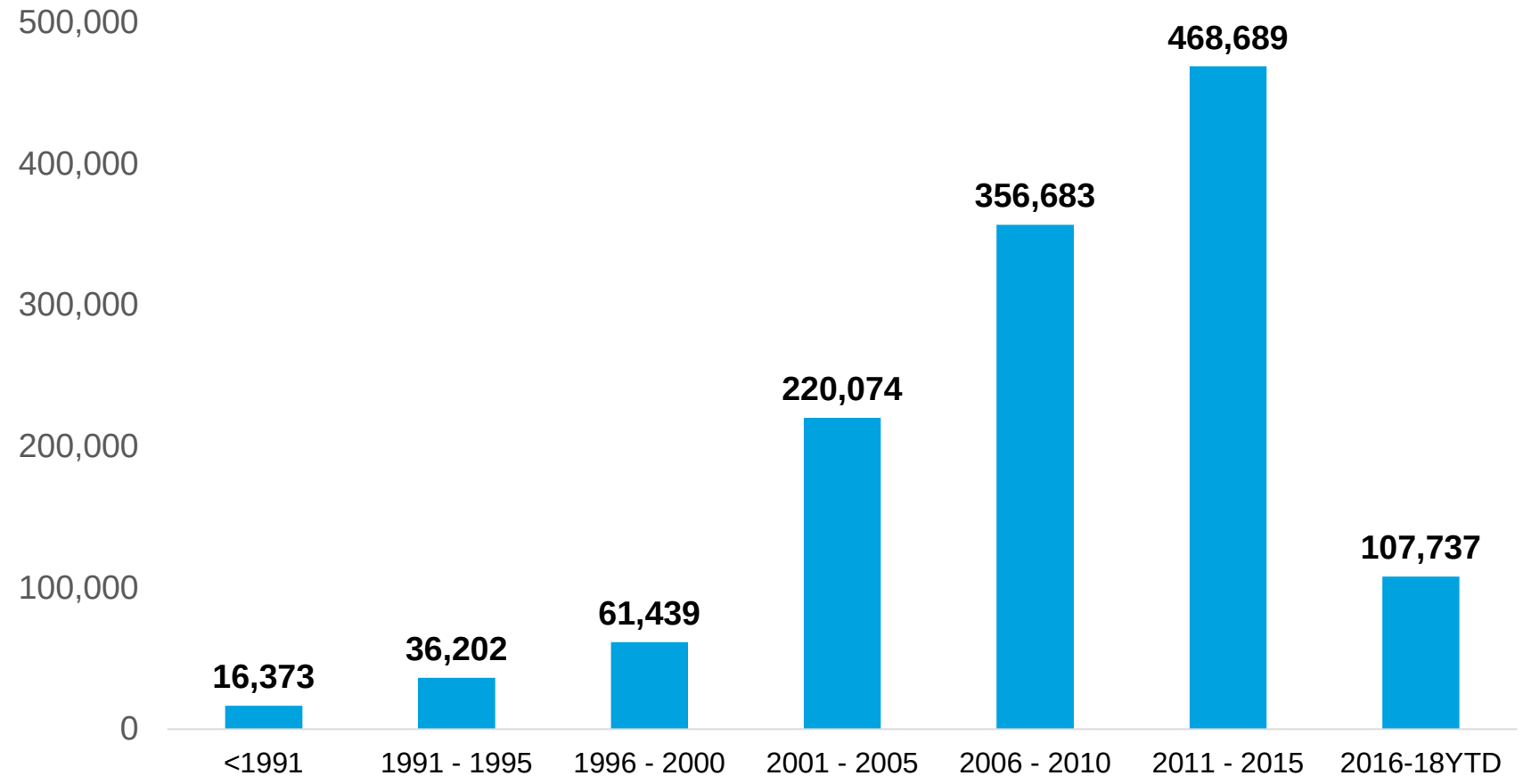
BY GLOBAL REGION



Source: ICF

Volume of PMA approvals has steadily grown since 1990; the pace appears to have slowed in 2016 and 2017

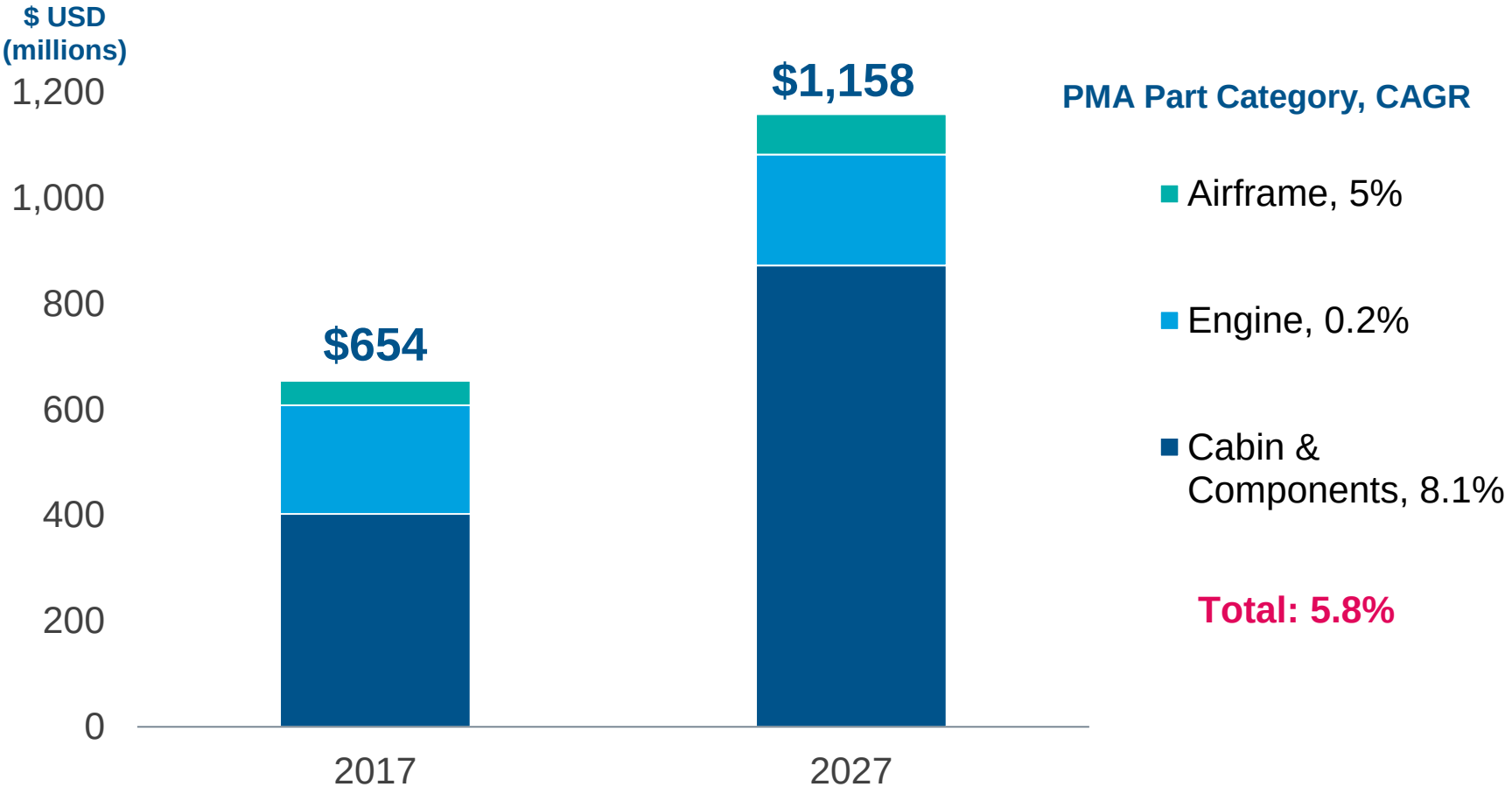
FAA APPROVED PMA PART NUMBERS BY APPROVAL YEAR



Source: Federal Aviation Administration – PMA Database extract June 2018

PMA is set to grow significantly over the next decade, growing at a 5.8% CAGR to >$1.15B by 2027

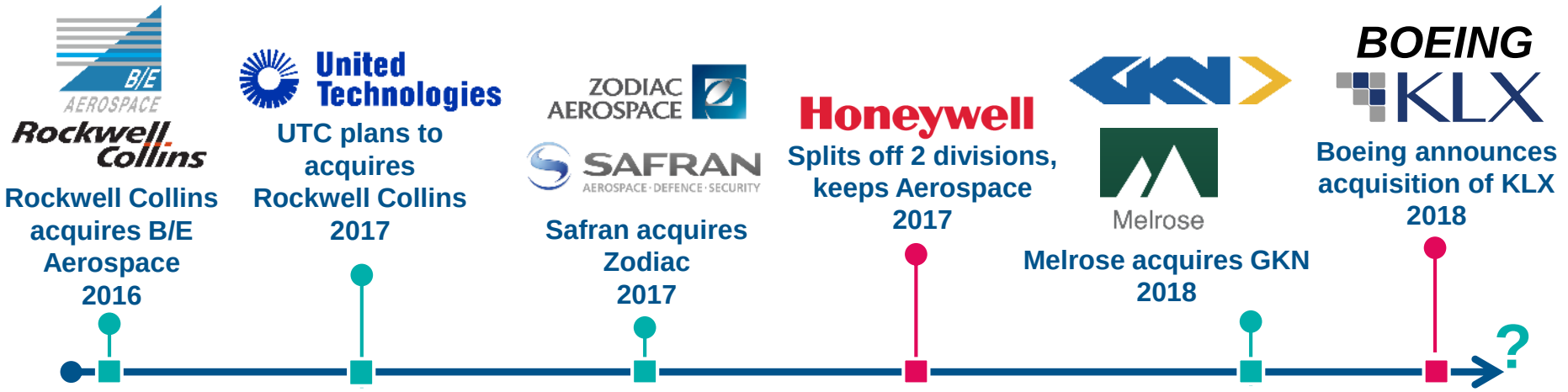
10 YEAR GLOBAL COMMERCIAL AIR TRANSPORT PMA DEMAND (CONSTANT 2017 US$)



Source: ICF, 2017 constant $

M&A Activity

Consolidation continues among System OEMs



Next?

Acquisitions?

Divestments?

Honeywell

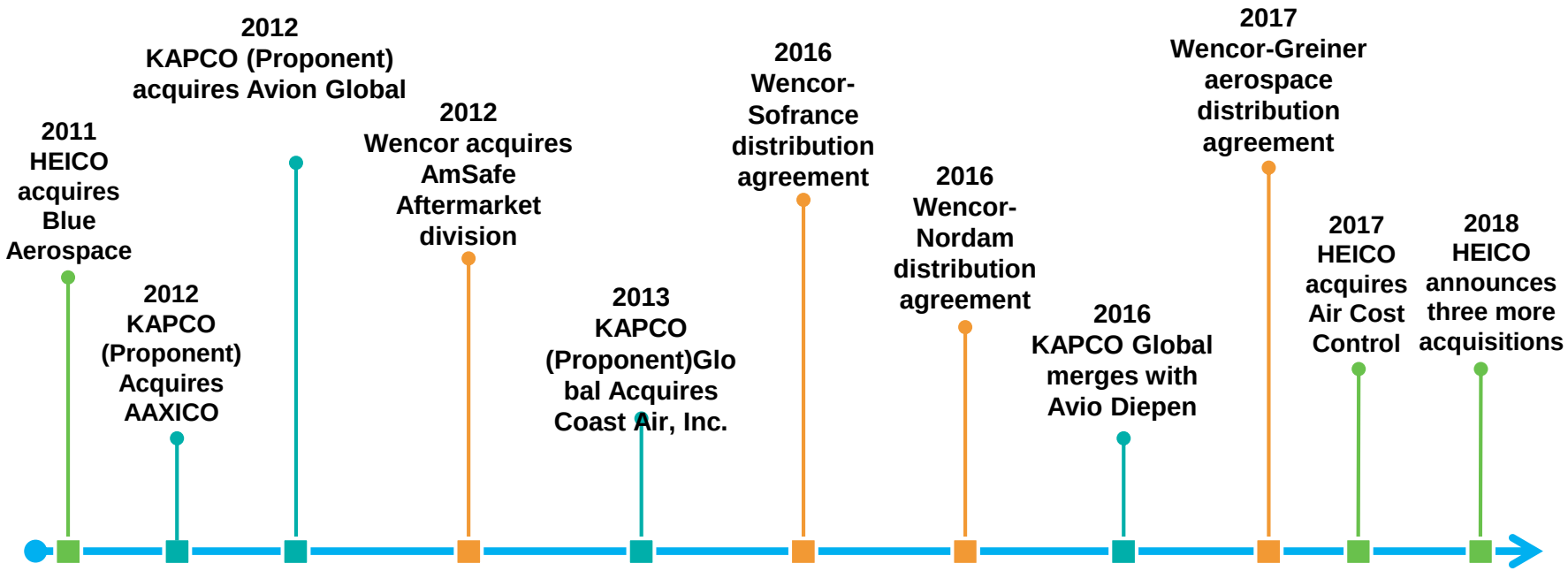
United Technologies

GE

?

Also, PMA suppliers have expanded their product lines and capabilities in distribution through M&A

PMA SUPPLIER DISTRIBUTION EXPANSION TIMELINE OVERVIEW



Growth Vectors:

- *M&A to add distribution and/or MRO capabilities*
- *Moving to offer "solutions" – bigger services to major airlines*
- *Leverage engineering resource (of interest to OEMs)*
- *Smaller PMA's working with larger PMA suppliers*

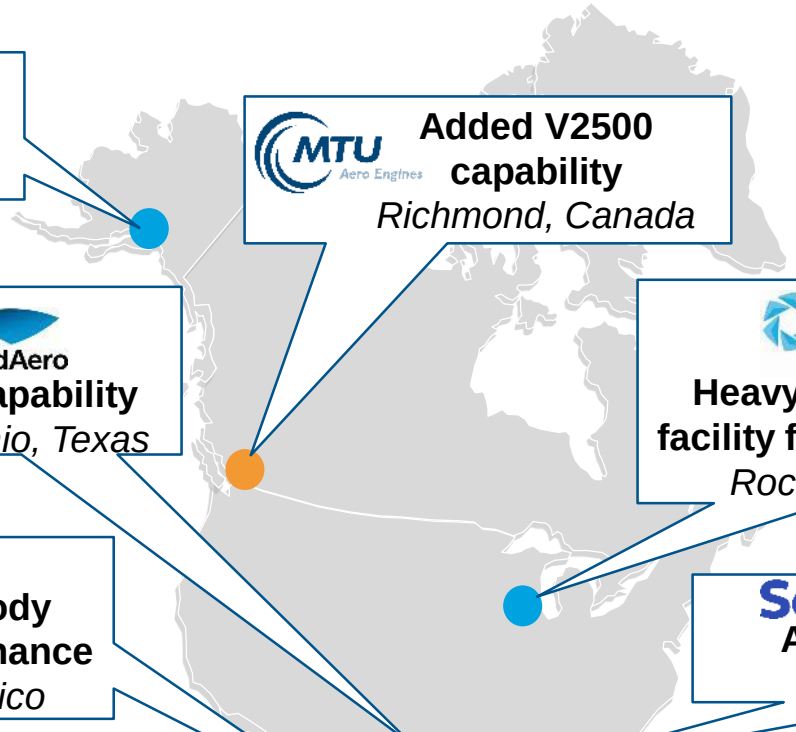
proponent

WENCOR GROUP

HEICO

Source: ICF Research

There continues to be expansion of MRO Capacity…



Alaska
2 additional bays for 737
Anchorage, Alaska

MTU Aero Engines
Added V2500 capability
Richmond, Canada

StandardAero
RB211 capability
San Antonio, Texas

AAR Doing It Right
Heavy maintenance facility for 2 WB aircraft
Rockford, Illinois

SAQ
New widebody heavy maintenance
Saltillo, Mexico

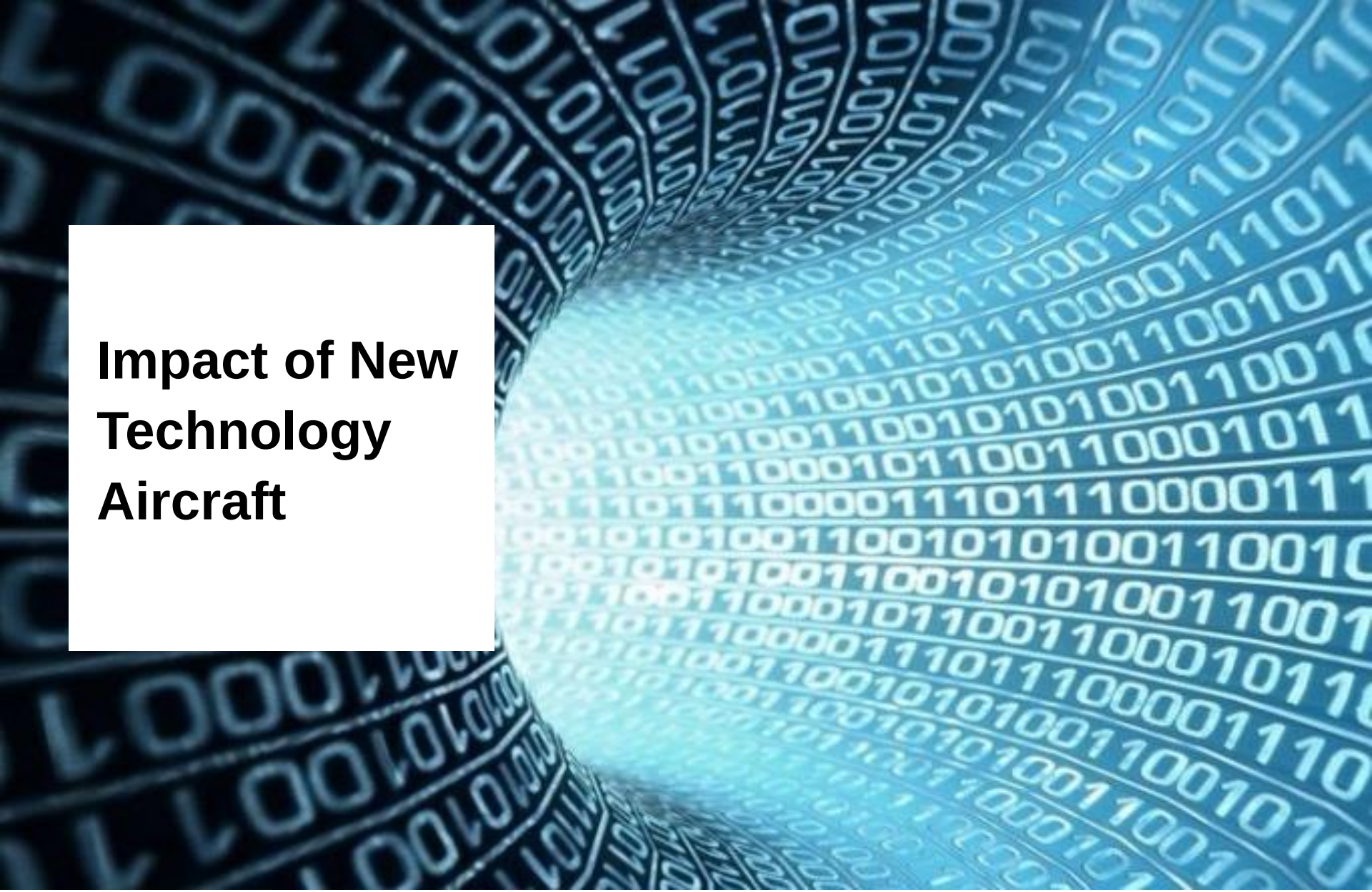
Southwest
Additional 6 NB bays
Houston, Texas

Mexicana MRO services
2 additional NB bays
Mexico City

AVOCET AVIATION
26,000ft NB line and heavy maintenance
Lakeland, Florida

Mexicana MRO services **IAI**
Conversion facility for 767s
Mexico City

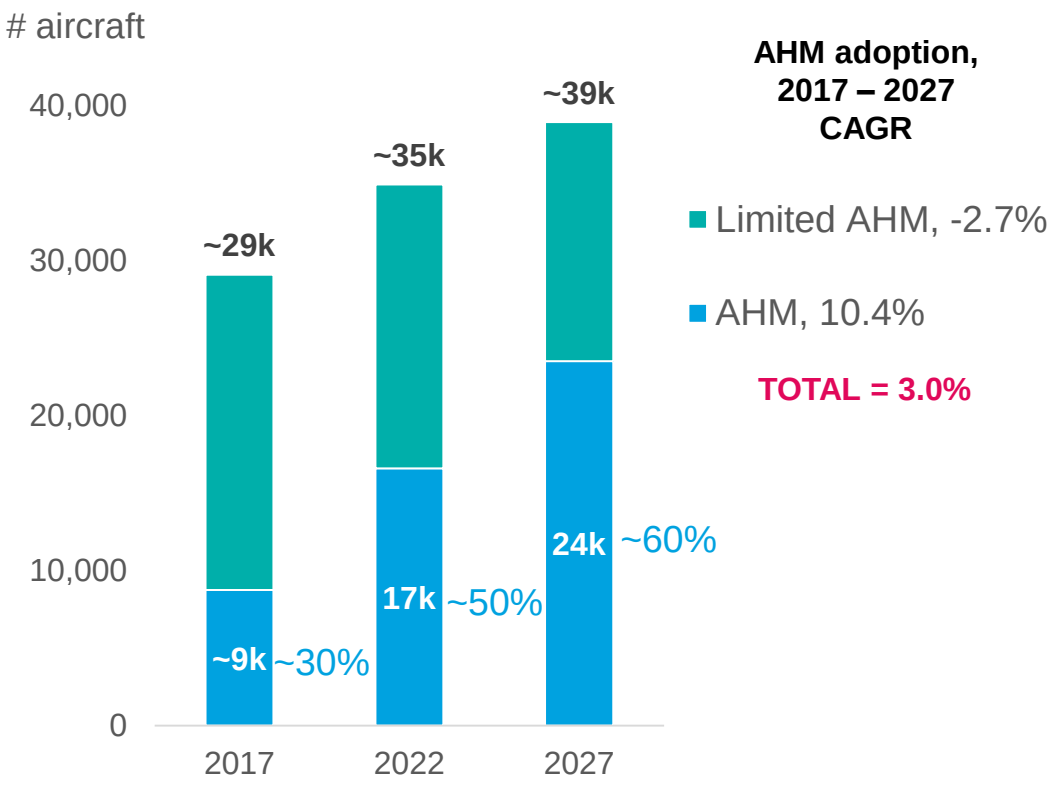
STS Aviation Group
Opening a 200,000ft modification centre
Melbourne, Florida



Impact of New Technology Aircraft

The fleet of e-enabled aircraft is set to more than double over the next decade

ICF IN-SERVICE AIR TRANSPORT FLEET FORECAST



Source: ICF

OBSERVATION

- ICF expects ~23,500 aircraft will be equipped with Aircraft Health Monitoring (AHM) by 2027, growing at 10.4% CAGR
- This is driving a digitisation of aircraft operations, which will see high growth in the e-enabled services and further advances in health management

AHM can be viewed as a subset of data management value chain…

Aircraft Data Management Value Chain

Aircraft Health *Monitoring* is inferring the state of the aircraft.

Aircraft Health Management is extracting value from this information.

Diagnostic

Troubleshoot while the aircraft is in flight or after it lands

Prognostic

Customize maintenance program to prevent unscheduled downtime

Diagnostics

Determining whether the component is performing its function

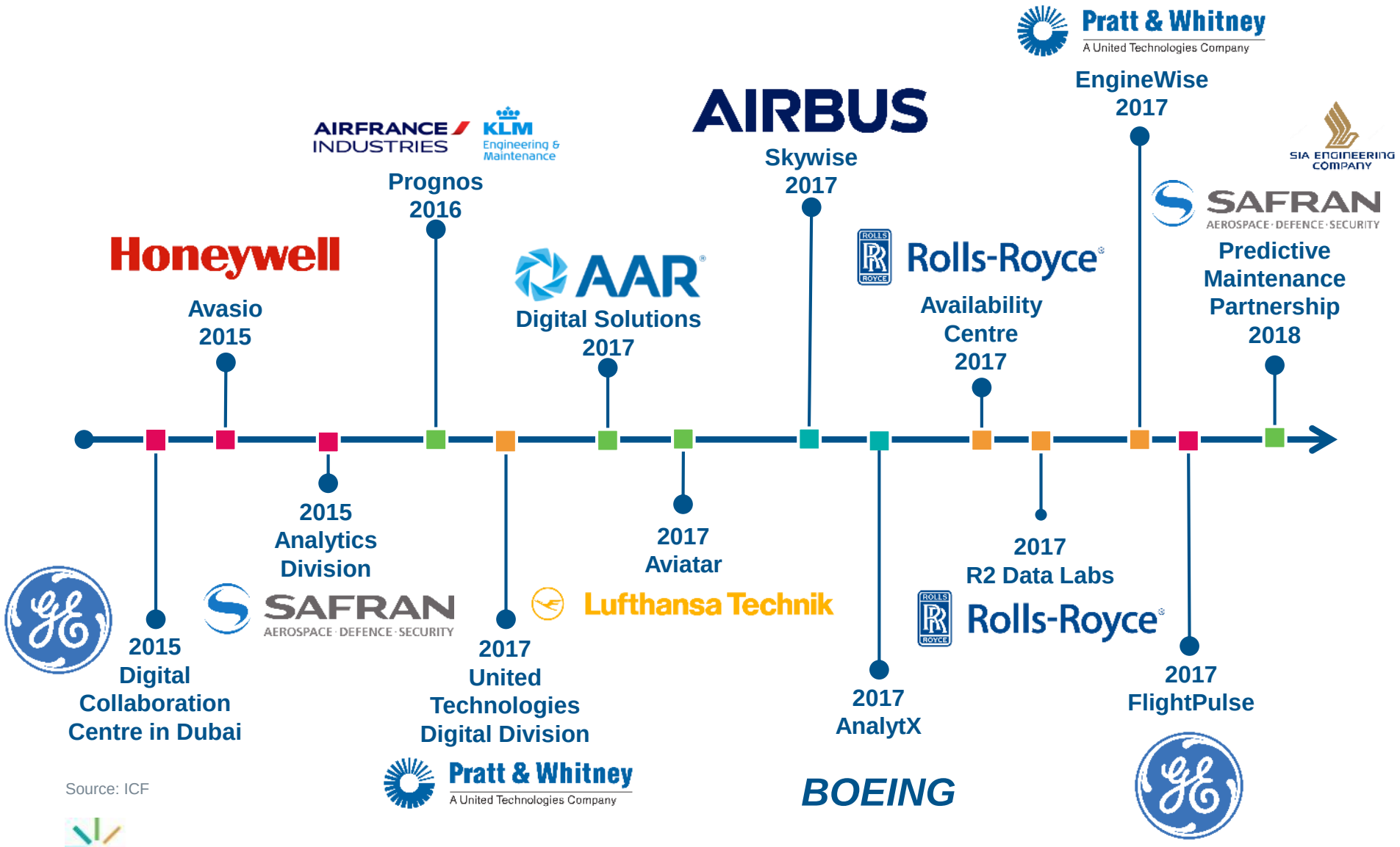
Prognostics

Predicting the remaining life of a component

Aircraft Health Management goes beyond predicting and replacing components, it incorporates flight operations and helps airlines in fleet and inventory management

Source: ICF

The race is on… new battlegrounds are emerging across the MRO market



Source: ICF

Digitisation could enable airlines to save in excess of $5B/year through lower fuel, maintenance and delay costs

Health Monitoring and Predictive Maintenance

- Airline Industry savings: **~$3B** *(conservative estimate)*
- Driven by improved dispatch reliability, No Fault Found reduction, Inventory reduction and Improved labour productivity

Fuel Cost Savings

- Airline Industry savings: **~$1.7B** *(conservative estimate)*
- Continuous flight optimisation through live weather updates, speed and altitude optimisation…

Delay Reduction

- Airline Industry savings: **~$0.8B** *(conservative estimate)*
- Improved turnaround process, in-flight routing optimisation

Source: ICF

Several airlines are seeing the first tangible benefits of their aircraft health monitoring trials

Results of Delta's Predictive Maintenance approach

Avoided Engine Events

1,000

(Over 1-year timespan)

Delta achieved a 100% completion factor for 241 days in 2017, with a 98% reduction in maintenance-related cancellations

Cancellation reduction

98%

(Over 2010 - 2016)

easyJet

31 Events

31 instances of Skywise correctly predicting faults before they occurred in service, allowing the carrier to intervene and remove components before they failed

Cathay Pacific

51%

Cathay Pacific reduced APU-related delay minutes by 51% using Honeywell's predictive maintenance trial program

Source: MRO-Network

Considerations

In Conclusion…

- The Global Air Transport MRO market outlook remains robust at $76B growing to $118B over the next decade (an expected growth of 4.6% per annum)
- North America generates $19.4B of MRO demand and will grow to $23B by 2027
- New technology aircraft and engines are creating both new challenges and opportunities for aviation stakeholders including how best to leverage big data to reduce operator costs, help increase efficiency and increase reliability

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