MRO
ENTRETIEN • RÉPARATION • RÉVISION
CONFÉRENCE
FAIRE DU MRO AU CANADA

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MRO Industry Outlook

ICF INTERNATIONAL

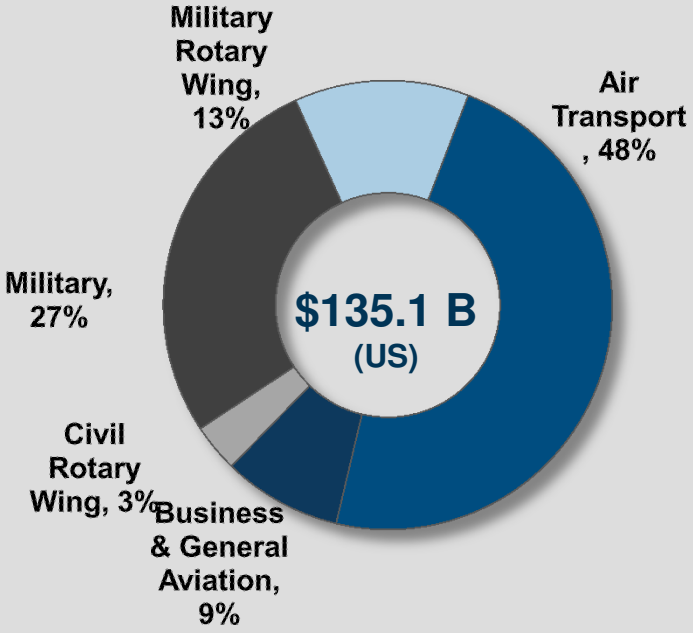
Today's Agenda

- MRO Forecast
- New Technology Aircraft Impact
- The Mystery Of 2015 Explained

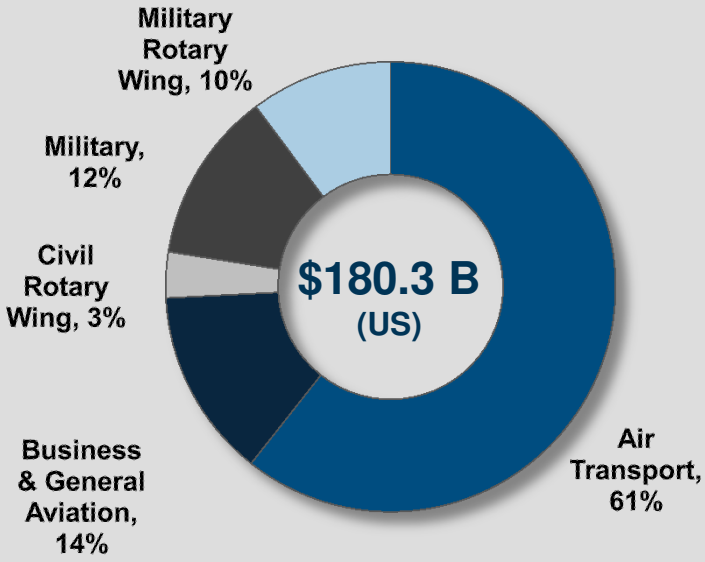
MRO Forecast

The MRO Market is worth $135B (US) for all segments – 75% of the value of current production aircraft

2015 Global Aerospace Industry



MRO Spend

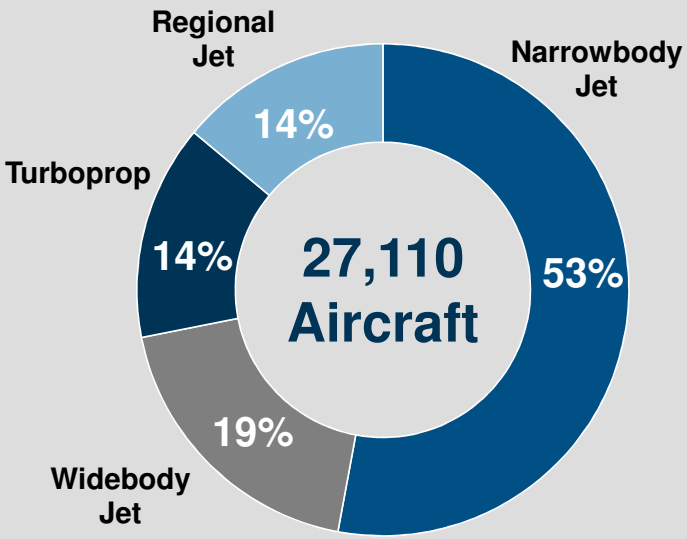


Aircraft Production

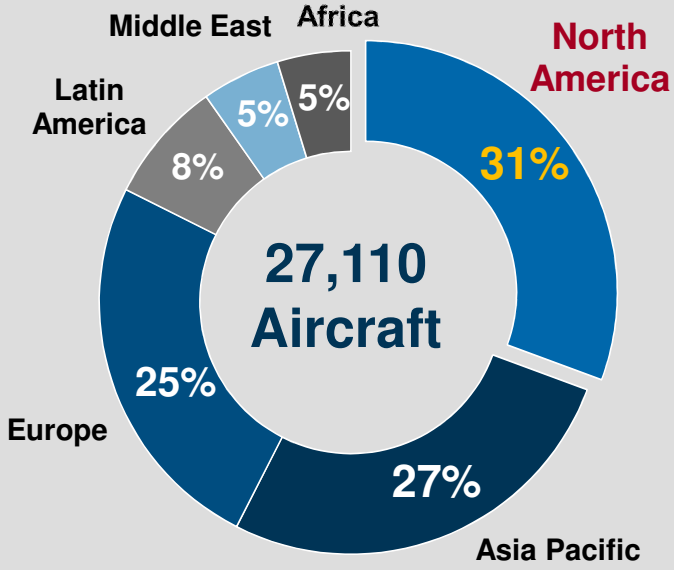
Source: ICF International

The current commercial air transport fleet consists of over 27,000 aircraft

2015 Global Commercial Air Transport Fleet



Aftermarket



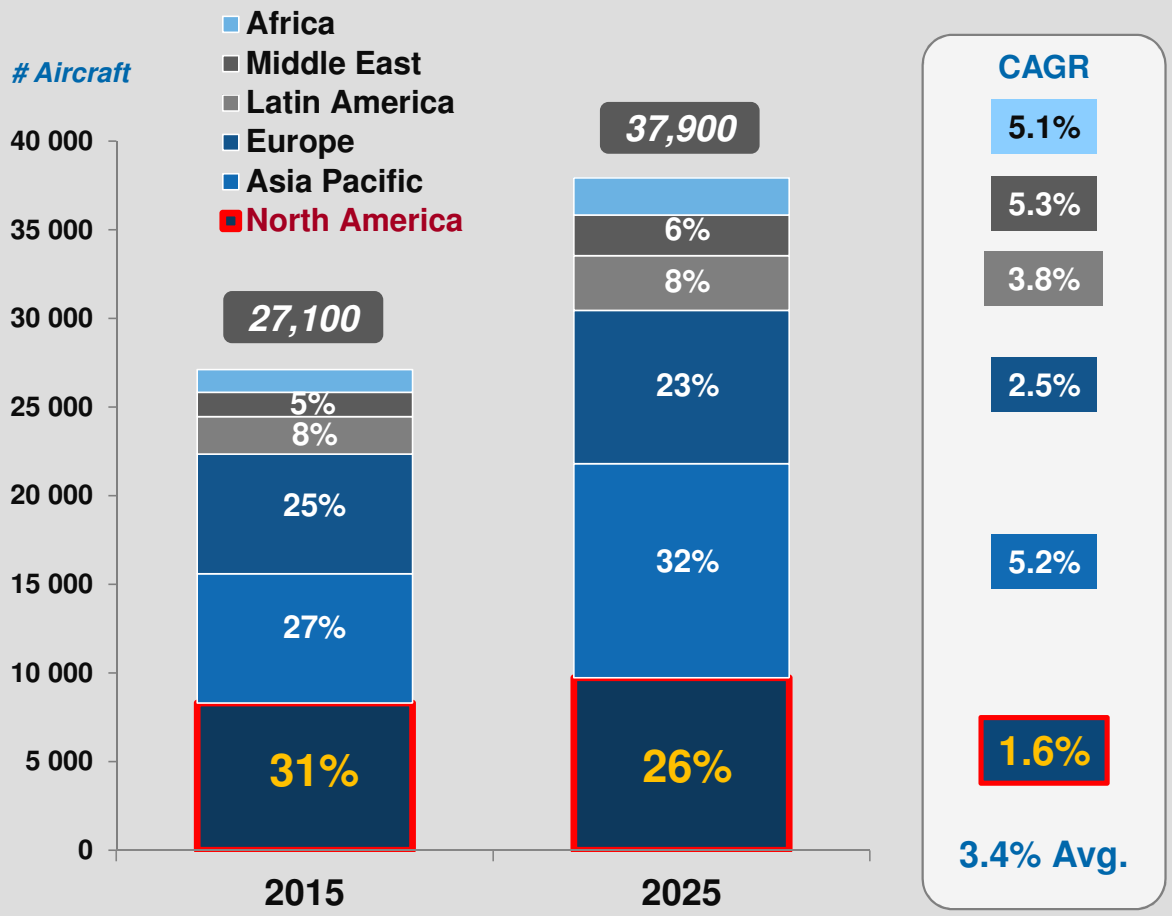
By Global Region

Source: CAPA 2015

19,600 aircraft deliveries are driven by a combination of robust air travel demand and high retirement volumes

- Air traffic growth of ~4.1%
- Fuel costs in $55/bbl range
- ~19,600 aircraft deliveries
- ~8,800 aircraft retirements

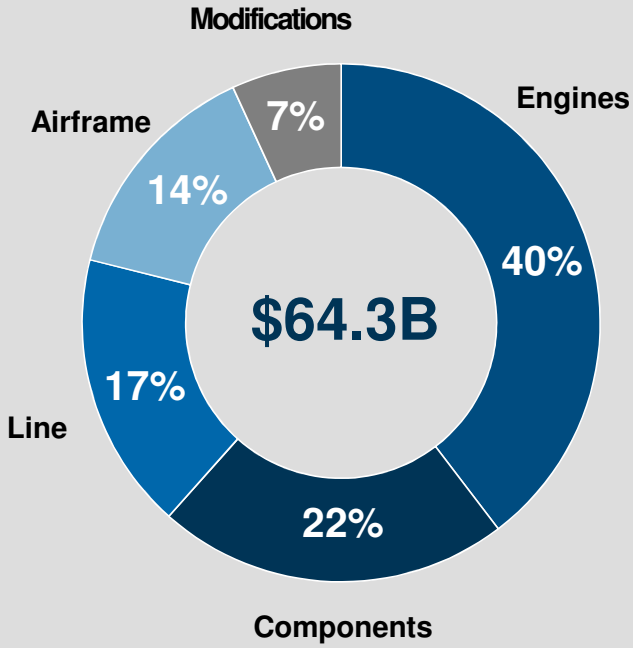
10 Year Global Air Transport Fleet Growth



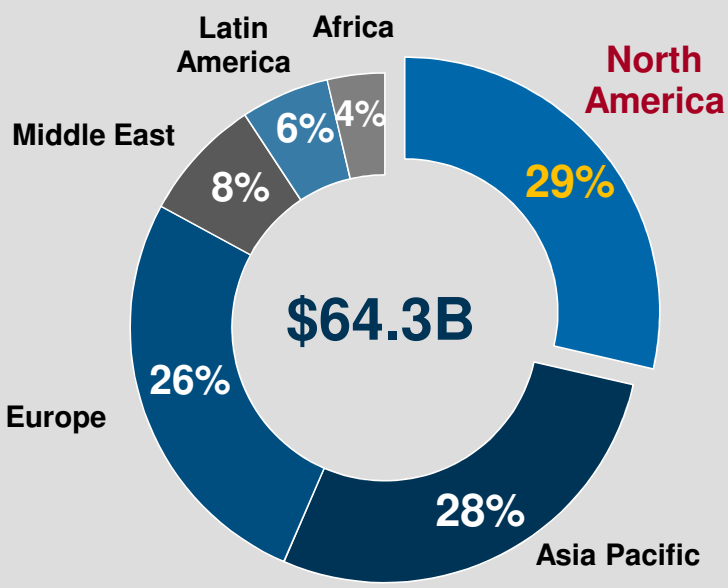
Source: ICF International, CAPA 2015

Current air transport MRO demand is $64.3B—*Asia Pacific is now equivalent to North America and Europe*

2015 Global MRO Demand



By MRO Segment



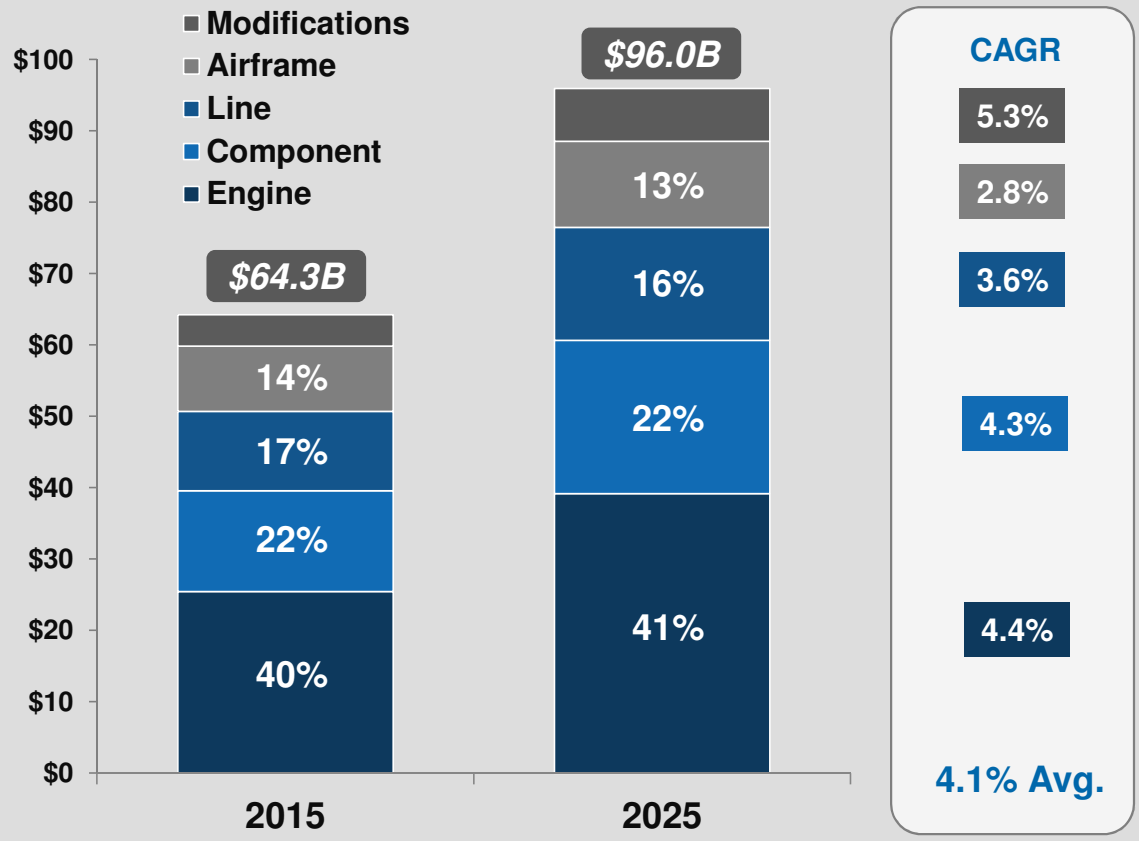
By Global Region

Source: ICF International

The global MRO market is expected to grow at 4.1% per annum to $96B by 2025

- ***Largest growth:***
  Engine MRO +$13.7B in annual spend 2025 vs 2015
- ***Strongest growth:***
  5.3% per annum in Modifications

10 Year Global MRO Demand Growth



Source: ICF International; Forecast in 2015 $USD, exclusive of inflation

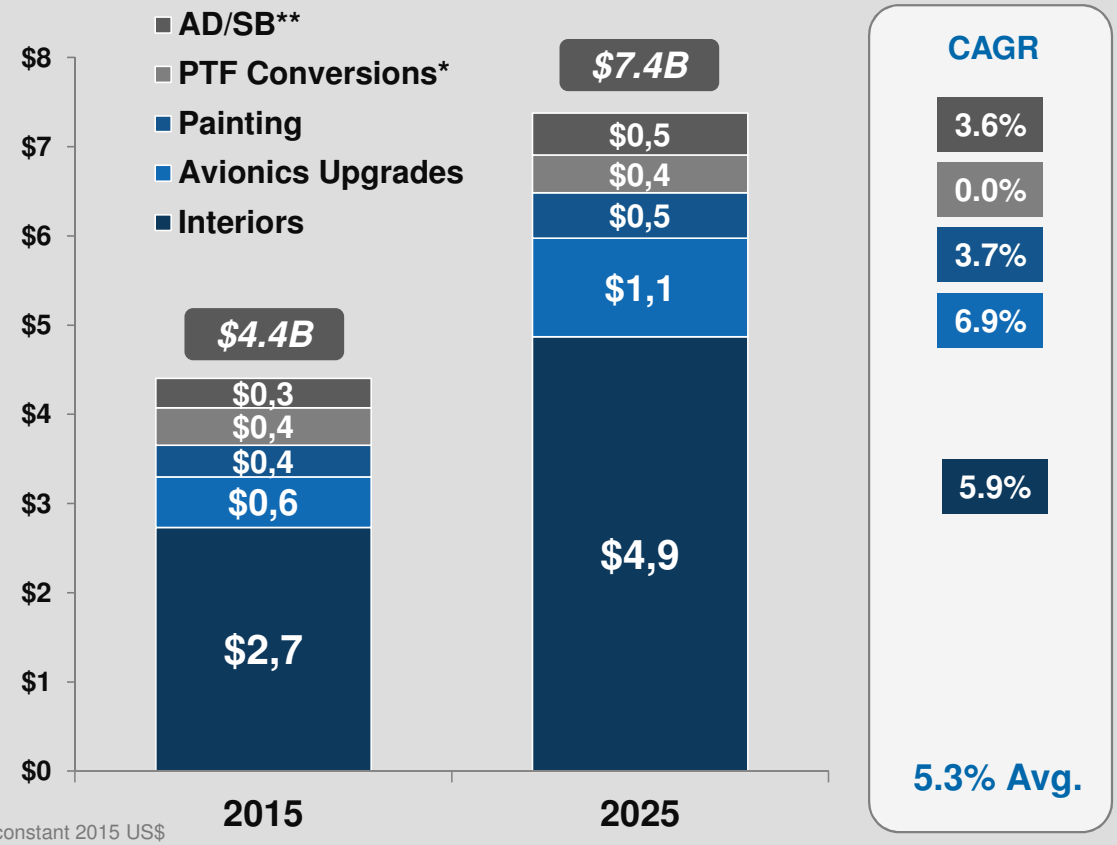
Modifications growth is driven by airlines seeking differentiation in the cabin *(now they have profits to reinvest)*

MRO modification market growth drivers include:

- **Latest lie-flat seats are now the minimum standard**
- **Premium economy**
- **Wi-fi, on-board connectivity**
- **Coming soon: ADS-B Mod program**
- **Capacity (ASM/K) increase**

Air Transport Modifications Forecast, 2015–2025

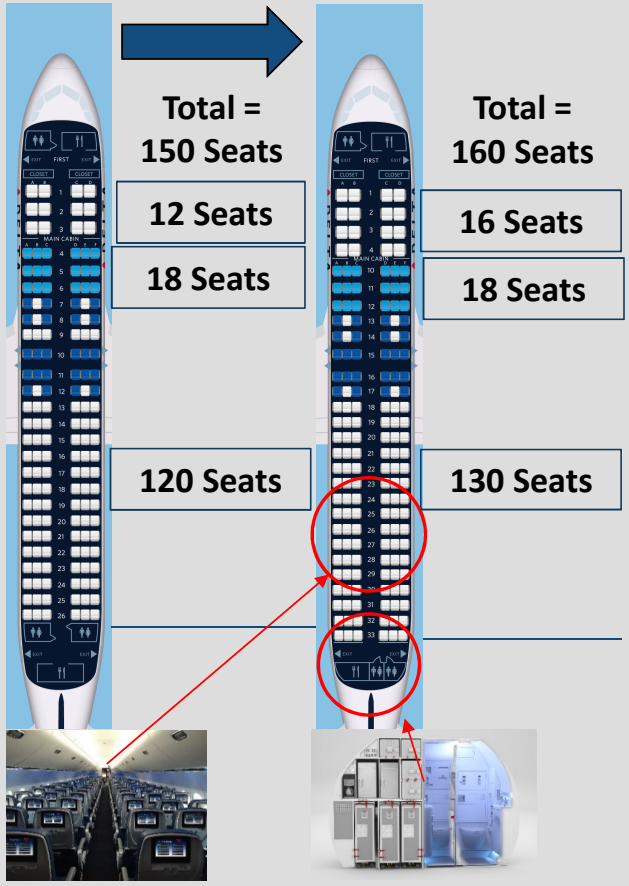
($USD Billions)



Source: ICF Analysis, constant 2015 US$
Modifications demand includes labor and material spend
*Passenger-To-Freighter Conversions
**Airworthiness Directives / Service Bulletins

Cabin modifications - including new slim line seats and fixtures - have enabled capacity up-gauging & and cabin "*densification*", driving lower unit cost and facilitating bottom line growth

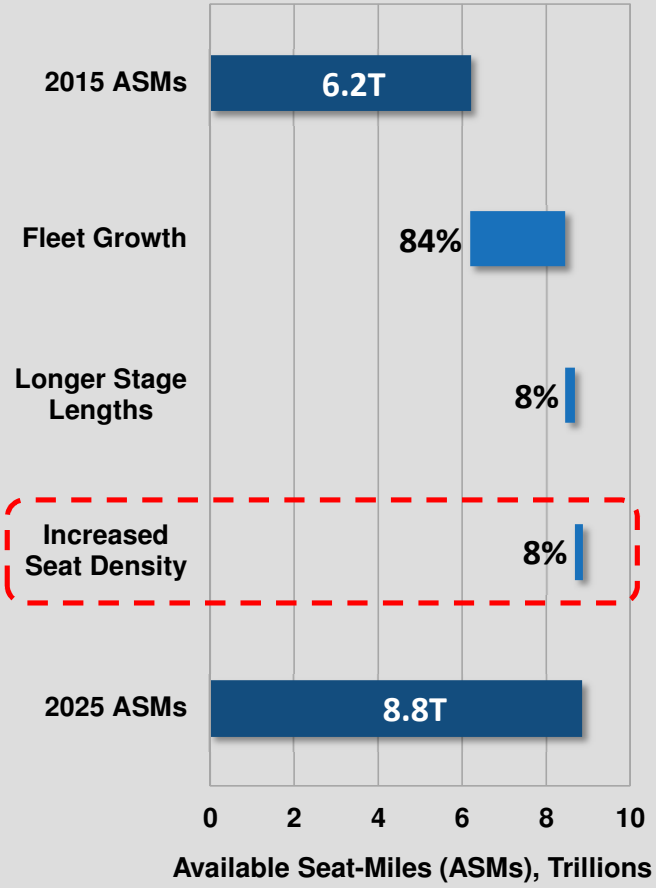
Delta A320 Interior Modification Program Overview



New seats, outlets, IFE, overhead bins

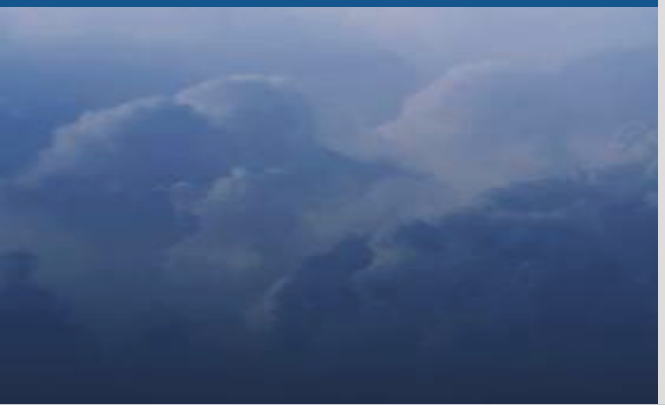
Space-saving galleys to add a row of seats

2015 - 2025 Capacity Bridge, by Contributing Factor



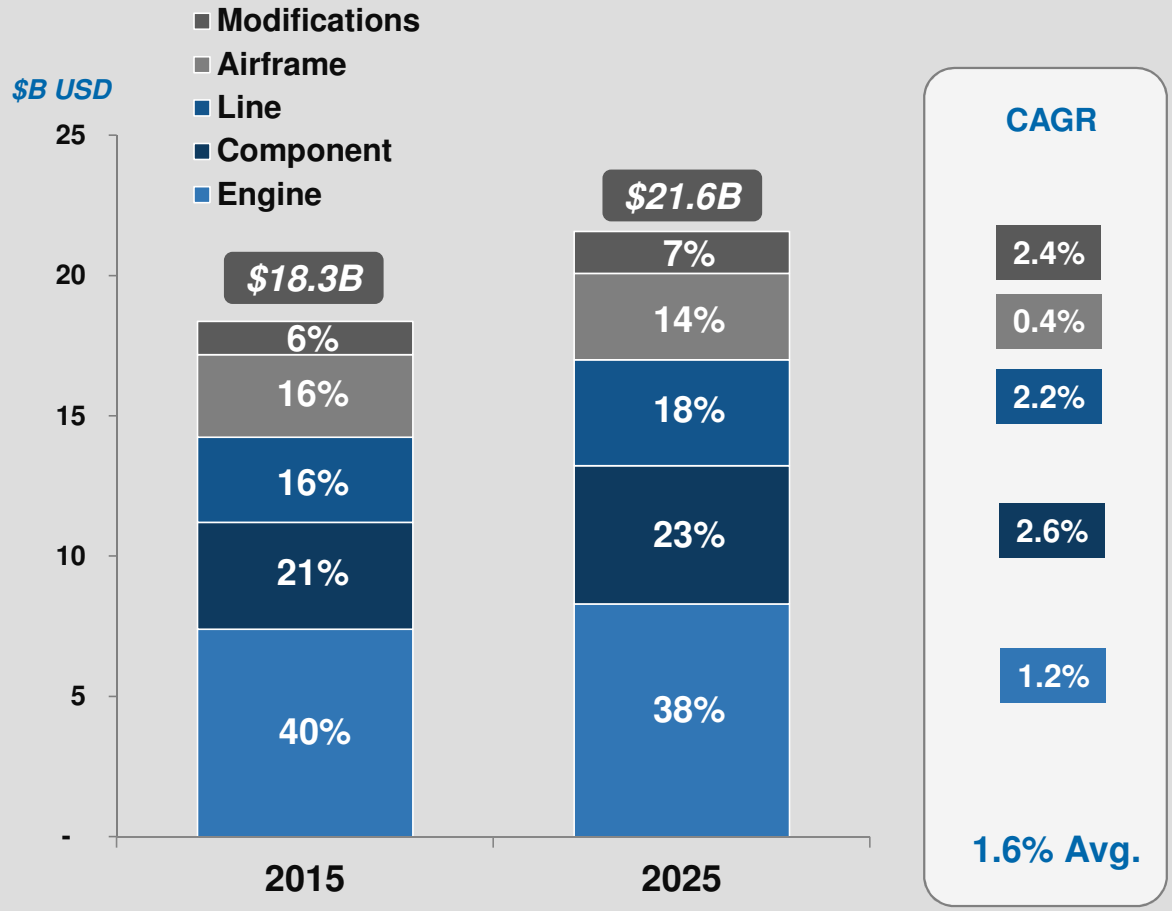
Source: ICF Analysis, Delta

The North American MRO market is expected to grow to ~$21.6B by 2025, at 1.6% per annum



North American MRO Demand by Major Segment

($USD Billions)

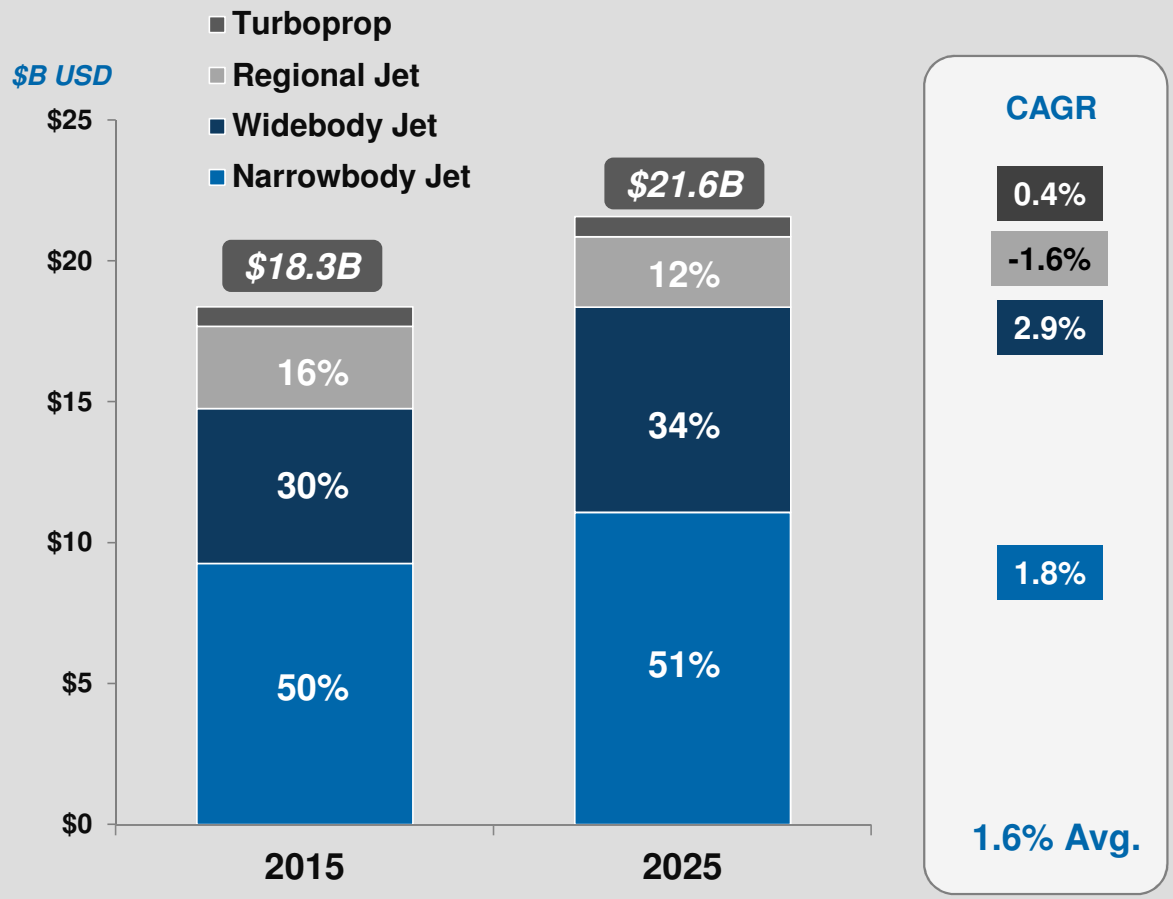


Source: ICF International; Forecast in 2015 $USD, exclusive of inflation

Future growth is driven by the narrow body fleet in $ terms and by the wide body fleet by % growth rate

North American MRO Demand Forecast by Fleet Type

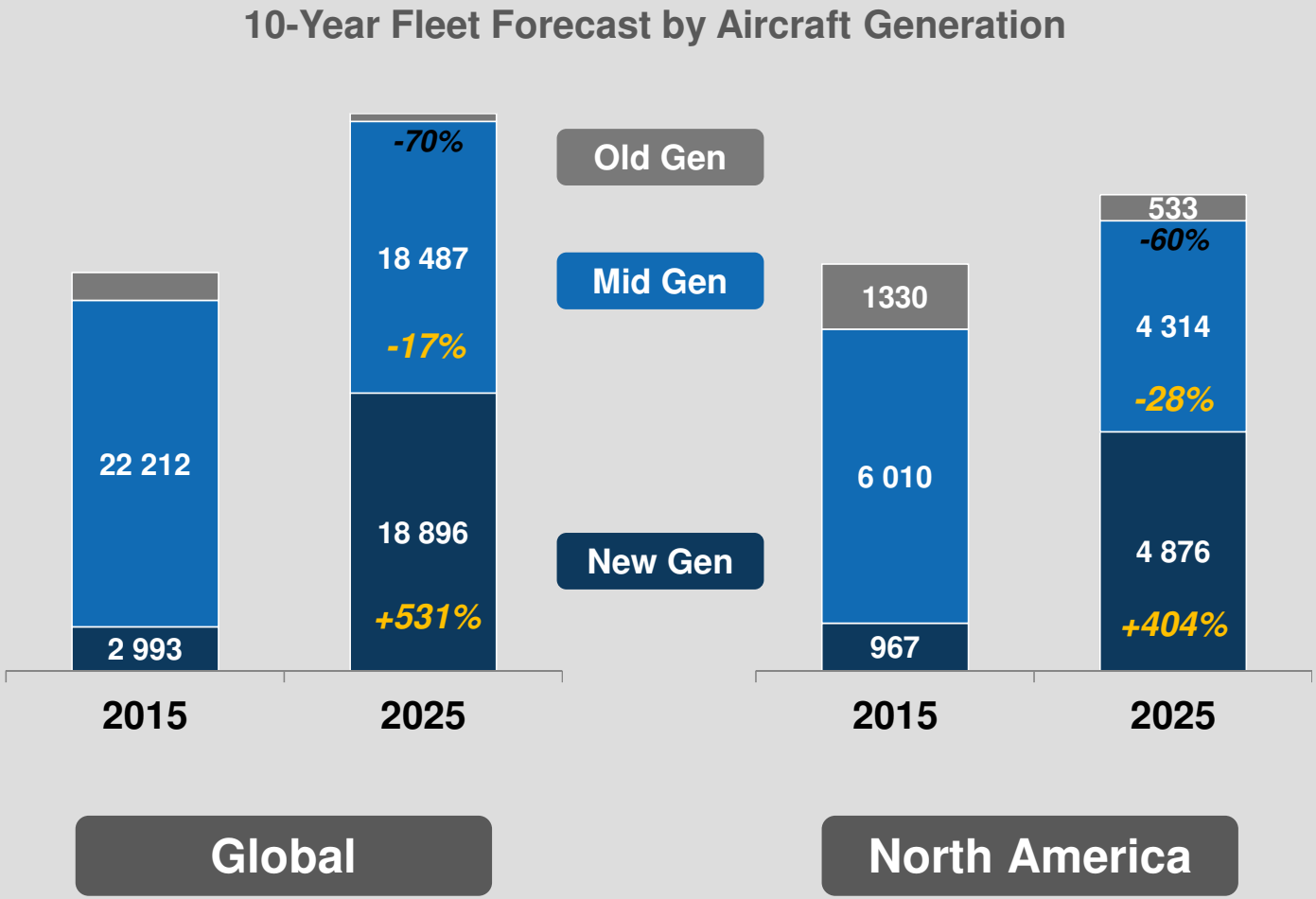
($USD Billions)



Source: ICF International, CAPA 2015

Impact of New Technology Aircraft

In the next decade, the fleet of new generation aircraft fleet will grow by approx. 530% to nearly 19,000 aircraft globally, and by ~400% in North America



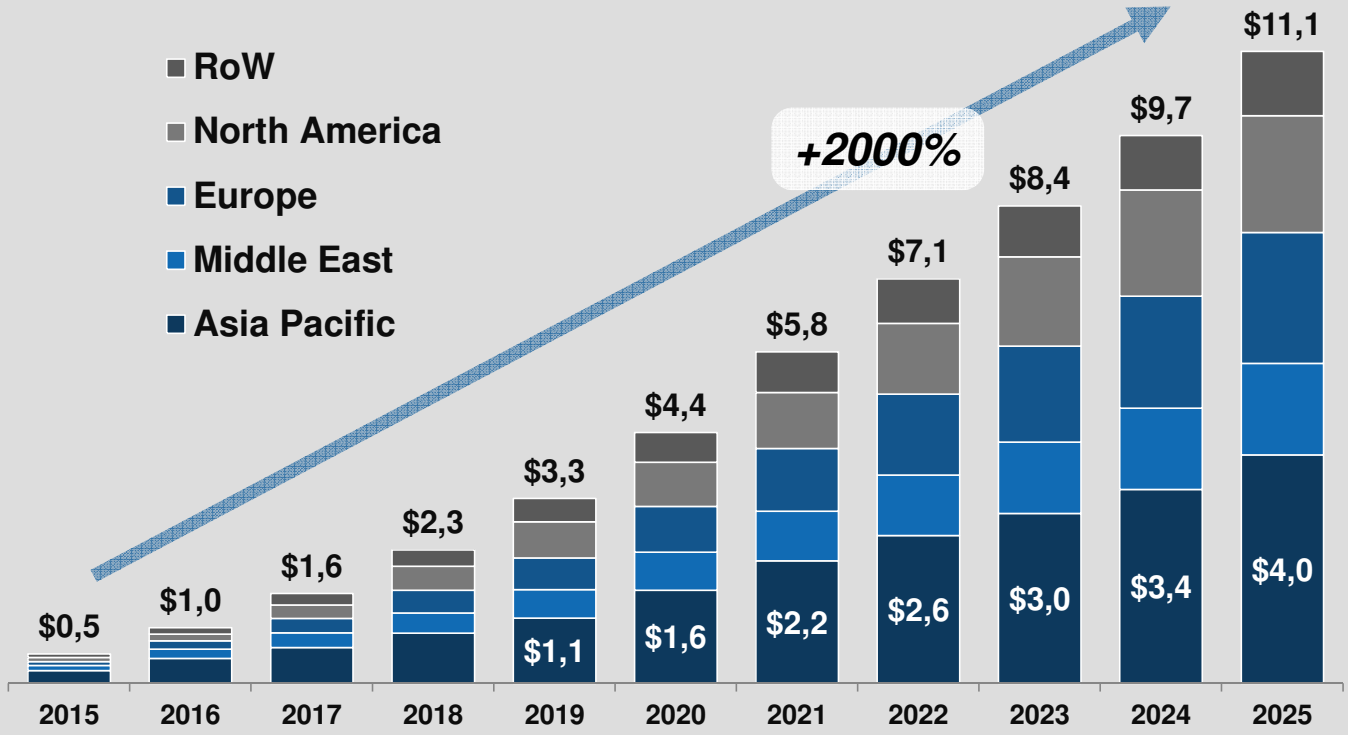
Source: ICF International
Old Gen: 727, 737 Classic, 747 Classic, DC10, L1011, A300
Mid Gen: 757, 767, 747-400, A320 Family, A330/A340, 737NG, 777, ERJ, CRJ
New Gen:, 777X, 787, A350, A330neo, A380, E170/175/190/195, CRJ-7/9/1000, 737MAX

Over the next decade, MRO spend on new technology Airbus A350 & Boeing 787 aircraft will double every three years

- Airbus and Boeing focus and interest should be no surprise!
- Engine OEMs also focused on big data

10-Year MRO Spend for New Technology A350 and 787 Aircraft

$ USD Billions

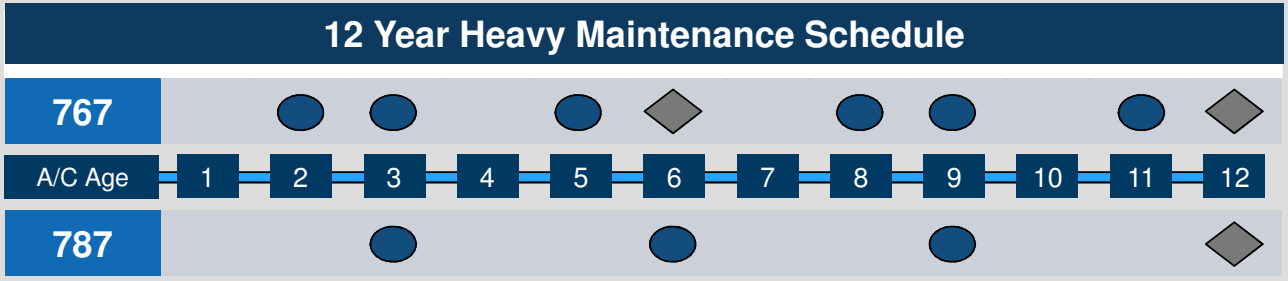


Source: ICF International; Forecast in 2015 $USD, exclusive of inflation, includes Boeing 787 and Airbus A350

New technology aircraft challenge traditional MRO sourcing strategies

Return on investment challenges:

- **Facilities**
- **Tooling & Equipment**
- **Training**
- **IT Systems**



	Impact		
	Volume *(C-checks)*	Intensity *(man-hours)*	Days *(Hangar)*
767	8	95,000	136
787	4	33,000	47

- **Cost Savings:** *~65% fewer routine airframe heavy maintenance man-hours drives an estimated savings of ~$3.5M*
- **Asset Utilization:** *~90 additional available flying days enables increased revenue generation potential*

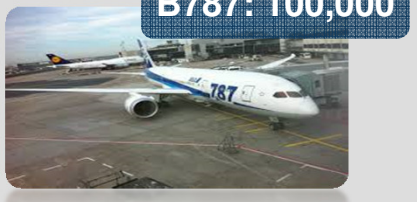
*Based on 4,000 FH/yr utilization
767 C-check = 18mo, 4C = 72mo; 787 C-check = 36mo, 4C = 144mo
Assumed industry standard labor man-hour rate
Aircraft out of Service (AooS) calculated for C/4C/8C checks assuming industry standard MRO hangar productivity

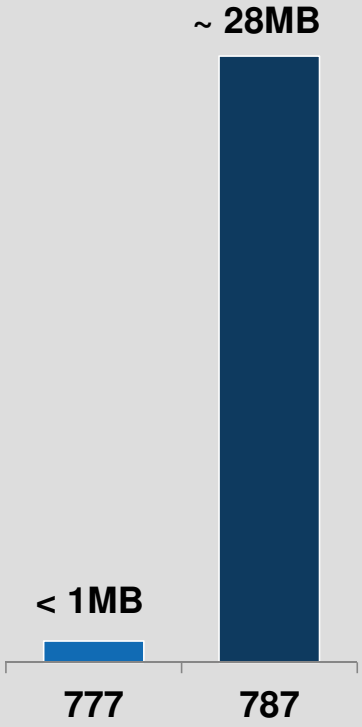
Challenge: **How best to realize value from the disparate terabytes of data generated by new technology aircraft**

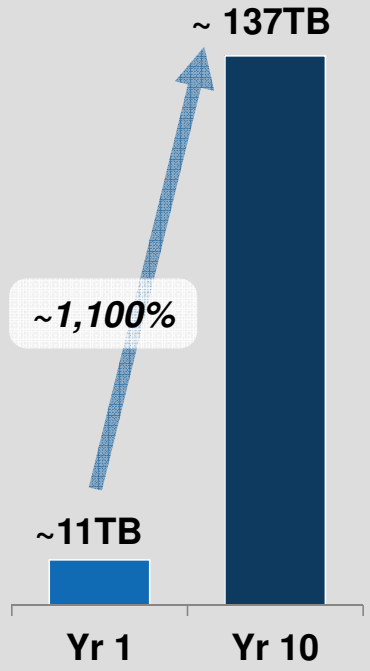
Stakeholder Battle:
Who will control and gain most from the operating data IP?

- **Operators**
- **Lessors**
- **OEMs**
- **MRO Suppliers**

Aircraft Health Monitoring and Data Generation Outlook







Number of AHM Parameters

Transmittable Data *(MB/Flt)*

A/C Data Generated *(TB/Year)*

Source: ICF Analysis

For New Technology Aircraft MRO, there are three key battlegrounds

- This new world is already rapidly changing the competitive landscape
- The outcomes and winners in these battles will define the future "winning business models"

Implications of New Technology Aircraft

Control of operational data

Critical to success in market participation and in gaining operational feedback for design and reliability improvement

Control of the Workscope

Critical to success in driving parts choice and aftermarket margins

Control of the Assets

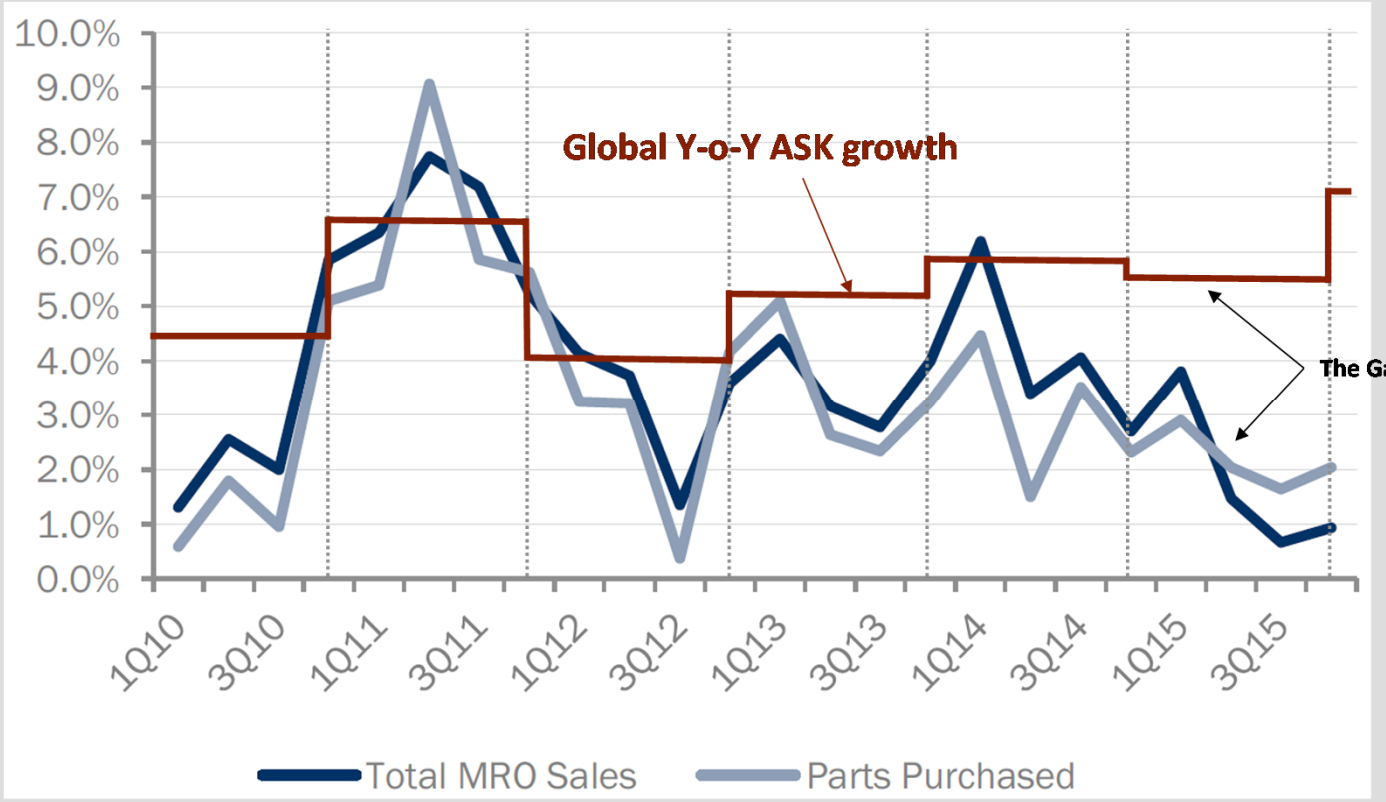
Critical to success in growing integrated service market

Source: IATA

The Mystery Of 2015 Explained…

In 2015, Air Transport MRO demand growth was considerably lower than global capacity growth

Air Transport MRO Demand Growth vs Global Capacity (ASK) Growth



Source: Canacord Genuity, IATA

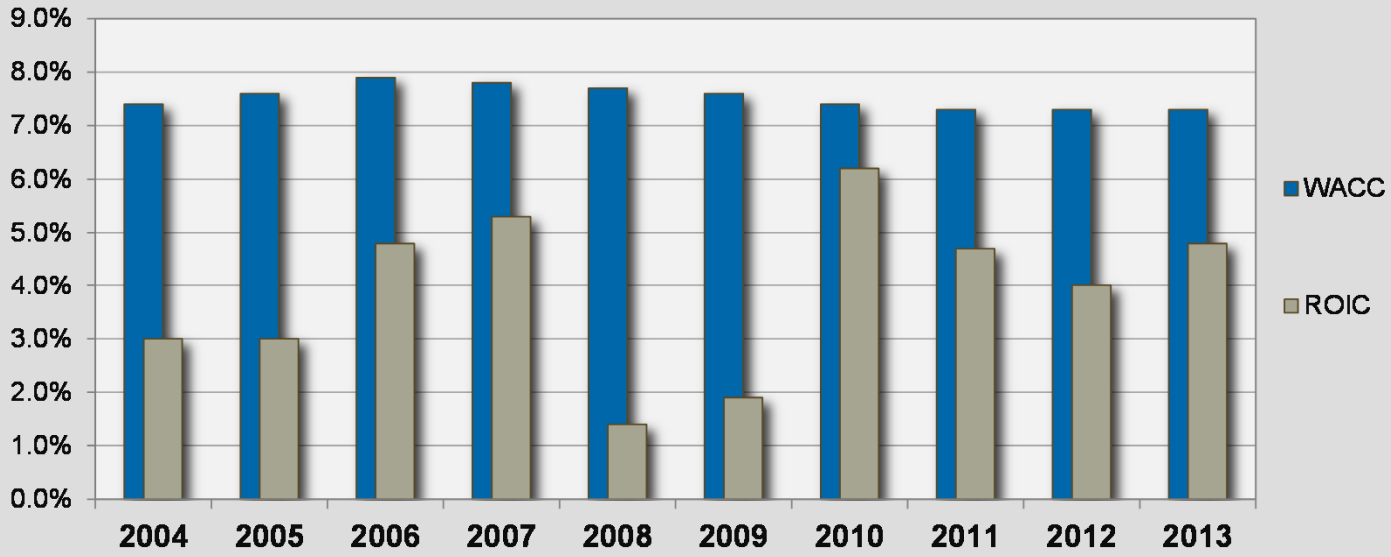
ICF believes that four major trends are behind the aftermarket shortfall

Factors Contributing To The 2015 Air Transport MRO Shortfall

Historically, airlines have not generated investor returns, and some airlines are intent to improve this…

RONA =
Return On Net Assets

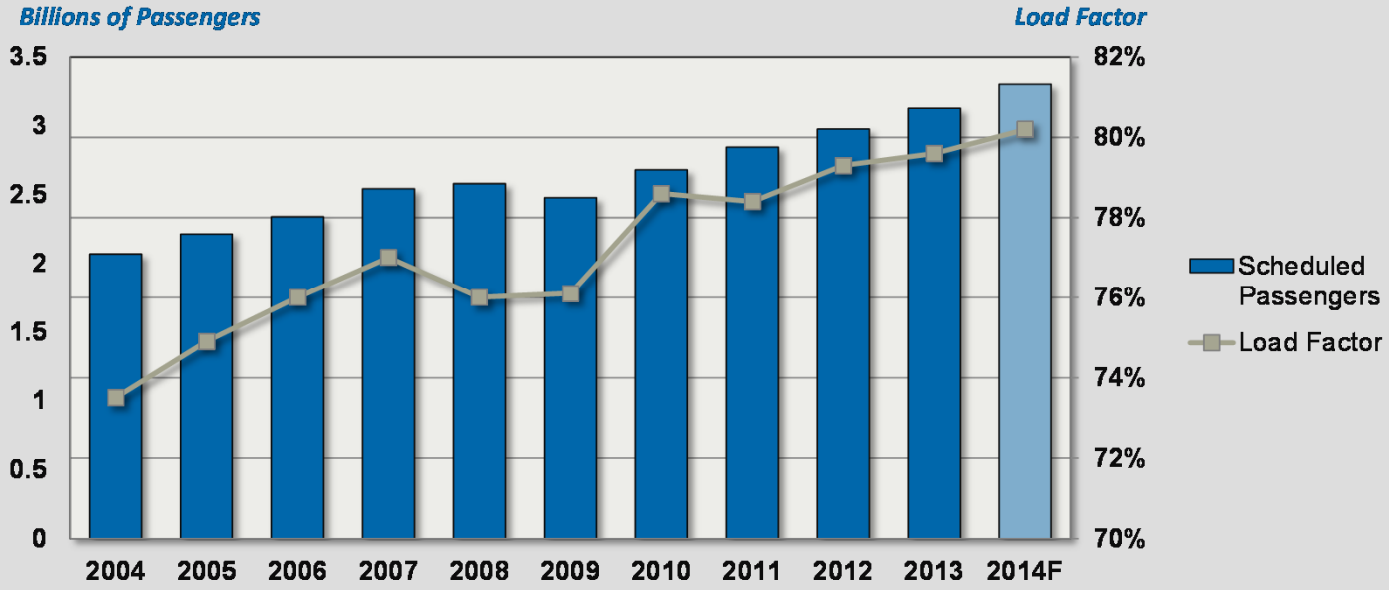
2004-2013 Global Airline ROIC vs. WACC



Source: McKinsey / IATA

…and for these airlines, capacity management and asset utilization are replacing market share as key metrics

2004-2014 Global Airline Scheduled Passengers



American Airlines

The airlines have historically been run by operationally-minded people, who tended to throw planes onto routes in a fight for market share. The name of the game is now capacity management, and the decision makers are the finance people.

Derek Kerr, CFO, American Airlines

Source: ICF Research / IATA

Delta Airlines is at the vanguard of this sea-change in airline management philosophy…

*It's been about changing the mindset and the approach to the industry, and really treating the airline industry like any other industrial business. For that reason, **we target 15% ROIC** just like other high-quality industrial transports.*

Richard Anderson, Former CEO Delta Airlines

Delta Airlines – Corporate Goals

A High-Quality Company

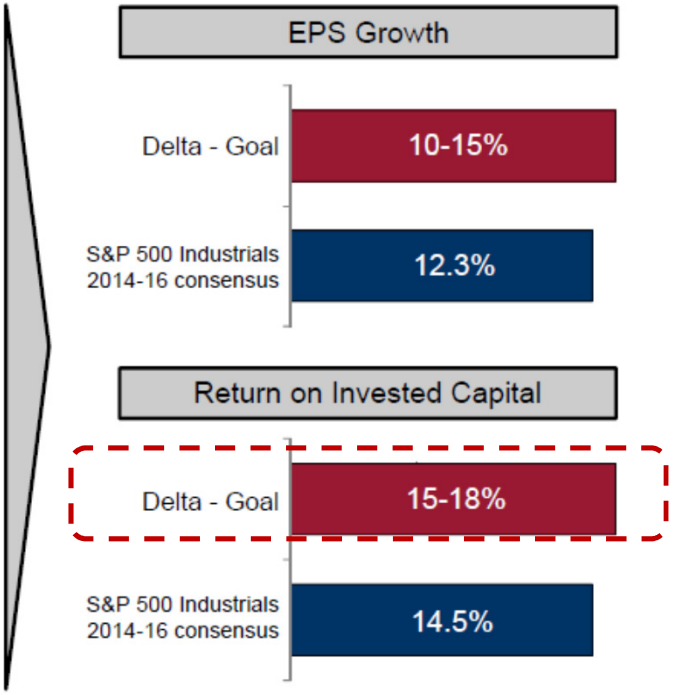
DELTA

Strong progress toward our long-term goals of generating solid margins and cash flow, an investment grade balance sheet and sustainable shareholder returns

Long-Term Goals

Operating Margin	•11-14% operating margins •*2014: 13%*
EPS Growth	• Annual EPS growth of 10%-15% after 2014 • *2014: 70% on pre-tax basis*
ROIC	• 15-18% return on invested capital • *2014: 20%*
Cash Flow	•$6 billion annual operating cash flow and $3 billion free cash flow •*2014: $6 billion operating cash flow and $3 billion+ free cash flow*
Balance Sheet	•$5 billion adjusted net debt by 2016 and pension at 80% funded status by 2020 •*2014: $7.2 billion adj. net debt at year-end*

Note: All results exclude special items; Delta ROIC reflects benefits of net operating losses



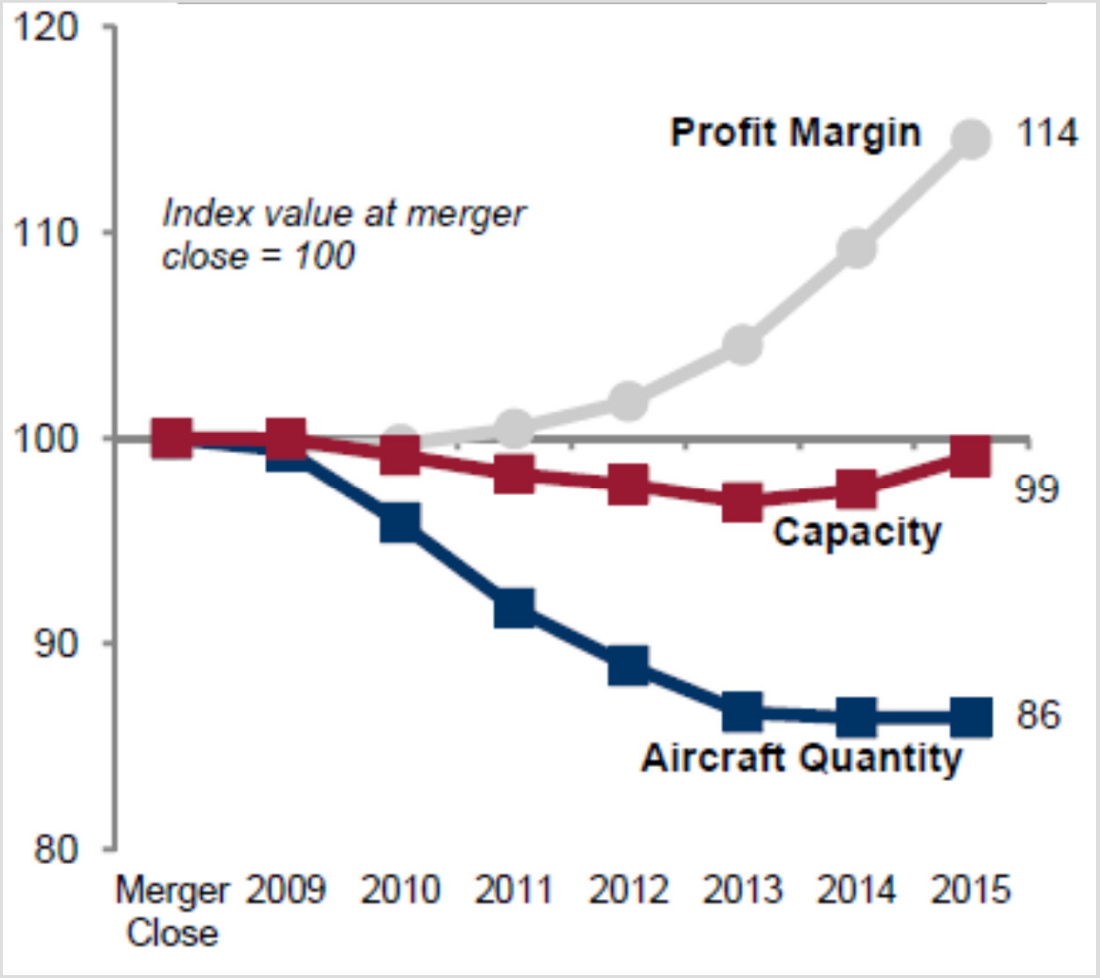
Source: Delta Airlines

Delta's approach to up-gauging results in the same capacity with 14% fewer aircraft…

"Historically in this industry, management teams became infatuated with new airplanes. Instead, we look at airplanes not as emotional decisions but as investment decisions. Each asset has to have a return on capital"

Richard Anderson, Former CEO, Delta Airlines

Delta Airlines – Domestic Fleet Trends



Source: Delta Airlnies

…Delta's philosophy results in reduced maintenance expenditures with reduced emphasis on OEM purchases

Delta Airlines – Maintenance Cost Savings

Delta 2012 & 2015 Results ($B)

	2012	2015	Δ
Revenue	36.67	40.70	+ 11%
Mx Materials & Outside Repair	1.96	1.85	- 6%

"Opportunities to acquire older airplanes and harvest them for parts has provided significant savings for us going forward in terms of a lower-cost basis for the overhauls that we have"

Paul Jacobson
CFO - Delta Airlines

- **Group dedicated to parting out aircraft has purchased aircraft from other operators to cannibalize (e.g. SAS MD80s)**
- **Actively cannibalizes its own retired aircraft, including MD80, 757, 767 and 747-400**
- **Leverages its internal engineering capability to develop DER repairs and modified repair scopes (e.g. hard time → on condition)**
- **Buys from OEMs only as last resort**

Source: Delta Airlines

A group of RONA-Driven airlines are following Delta's lead and holding the line on maintenance expenditures

- AIR CANADA
  - ROIC = 18.3%
  - Operating margin = 10.3%
- WESTJET
  - ROIC = 15.3%
  - Operating margin = 14.1%

Examples Of RONA-Driven Airlines

FedEx

- Cannibalizes parked aircraft, burns green-time from engines, parks aircraft to avoid maintenance events
- Aggressive user of USM to substitute for repairs

British Airways

- Retiring 737 Classics, 747-400s and 767s
- Utilizing cannibalized USM to support remaining fleets
- Preference to use own USM rather than purchasing

Southwest

- Retiring 737 Classics, utilizing cannibalized USM to support remaining fleets and engines
- Partnering with Avioserv

Others AIR CANADA, WESTJET, IBERIA, UNITED, Lufthansa, American Airlines, KLM

RONA-driven airlines operate ~ 25% of the air transport fleet

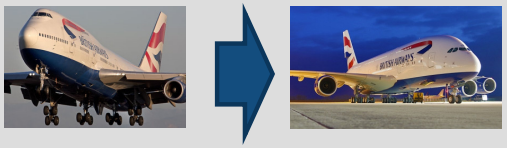
Source: ICF International

New aircraft provide airlines with the opportunity to change their maintenance buying behavior to include asset pools

Evolution Of Component Support Buying Behavior

BRITISH AIRWAYS

747-400 → A380



In-house / Traditional Purchasing

Outsourced: Airbus FHS

JAPAN AIRLINES

767 → 787

In-house / Traditional Purchasing

Outsourced: Lufthansa Technik TCS UTAS CARE

BRITISH AIRWAYS

767 → 787

In-house / Traditional Purchasing

Outsourced: Boeing GoldCare

UNITED

767 → 787

In-house / Traditional Purchasing

Outsourced: Boeing GoldCare

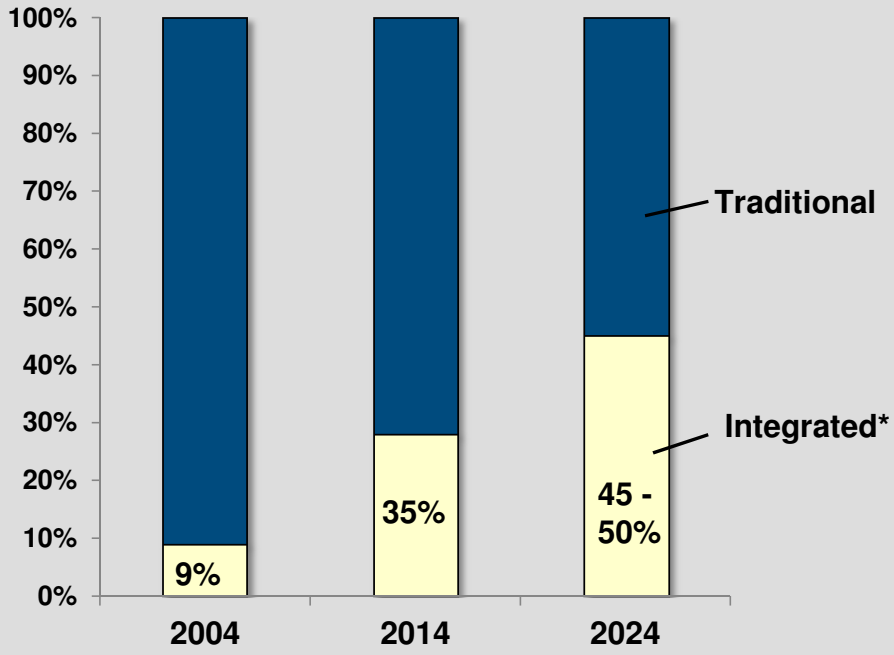
The upshot: operators enter rotable pools rather than traditional spares provisioning from component OEMs

Source: ICF research

The share of integrated programs in component support is increasing, which is limiting initial provisioning sales

Integrated programs shift rotable assets to suppliers; the more inventory held by a supplier, the lower the inventory cost per aircraft supported

Integrated Component Programs Penetration



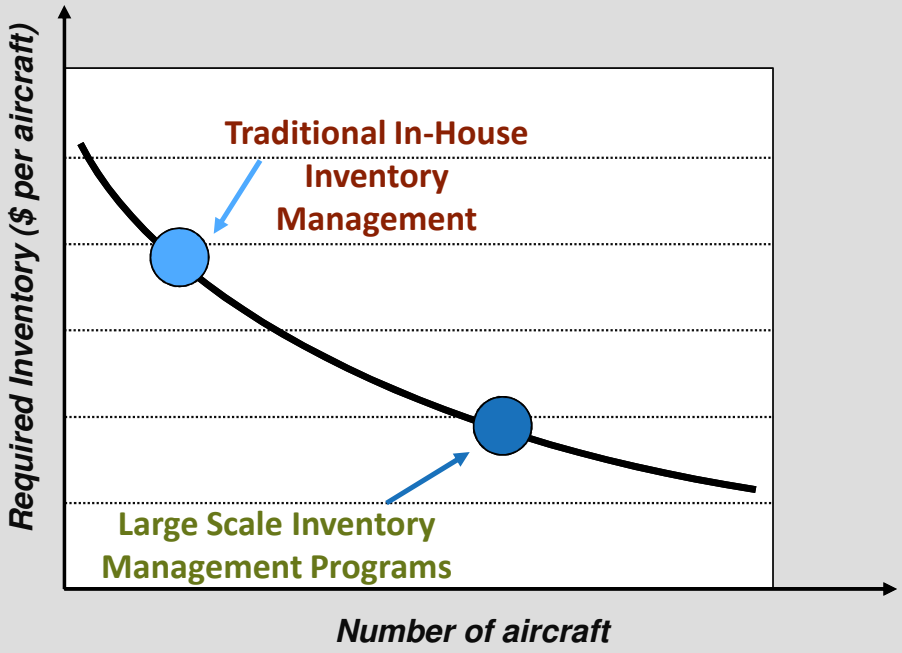
Growth Drivers

- *Small fleet size*
- *Perceived technology risk*
- *Improved ROIC*
- *Maintenance no longer core activity*
- *Predictable outgoings*
- *Attractive value propositions*
- *Lower investment, less infrastructure*

Source: ICF International

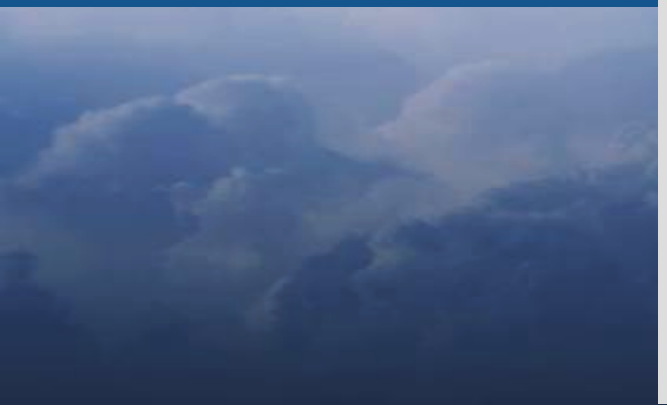
Pooling results in greater asset productivity…and less demand for initial provisioning

Notional Inventory Holding Curve



Source; ICF International

Four types of suppliers are pursuing integrated MRO programs…and rotable pooling



Integrated MRO Suppliers

Aircraft OEMs

- Airbus has ~12 Flight Hour Services contracts covering A330, A380, and A350XWB; A320neo is a key target
- Boeing recently signed GoldCare 787 contracts with BA, United and Oman; is also gaining ground on 777

Component OEMs

- UTAS and Collins offer integrated MRO programs covering their own products; Moog recently developed its own program and signed several customers
- OEM services is a JV providing A380 pooling with four partners

MRO Integrators

- LHT is the market leader in integrated component maintenance and is gaining momentum in new generation aircraft
- Other key players include SR Technics, Air France/KLM, AAR, and ST Aerospace

Asset Mgmt. Firms

- Asset management specialists have added MRO capabilities to their core businesses
- Hedge funds and UHNWI investors are providing capital for growth

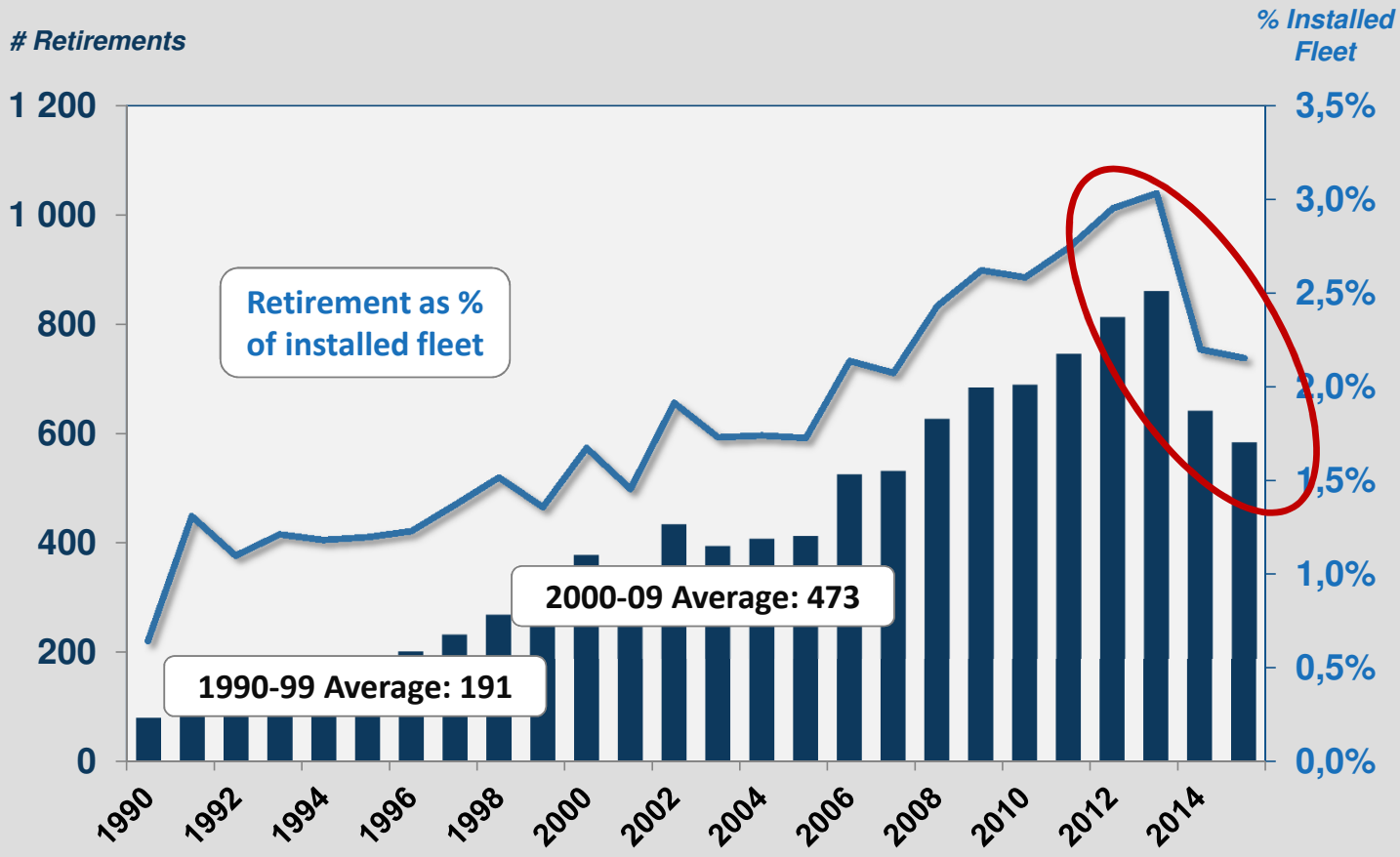
Source: ICF International

The availability of used and serviceable material (USM) has grown with aircraft retirements in recent years…

Potential Impact:

- **Airline capacity increases**
- **Reduced part-out feed stock for surplus market**
- **Increase in airframe and engine MRO spend on older airframes**
- **Less pressure OEM new parts sales**
- **Higher used part values / pricing**

Commercial Air Transport Annual Aircraft Retirements

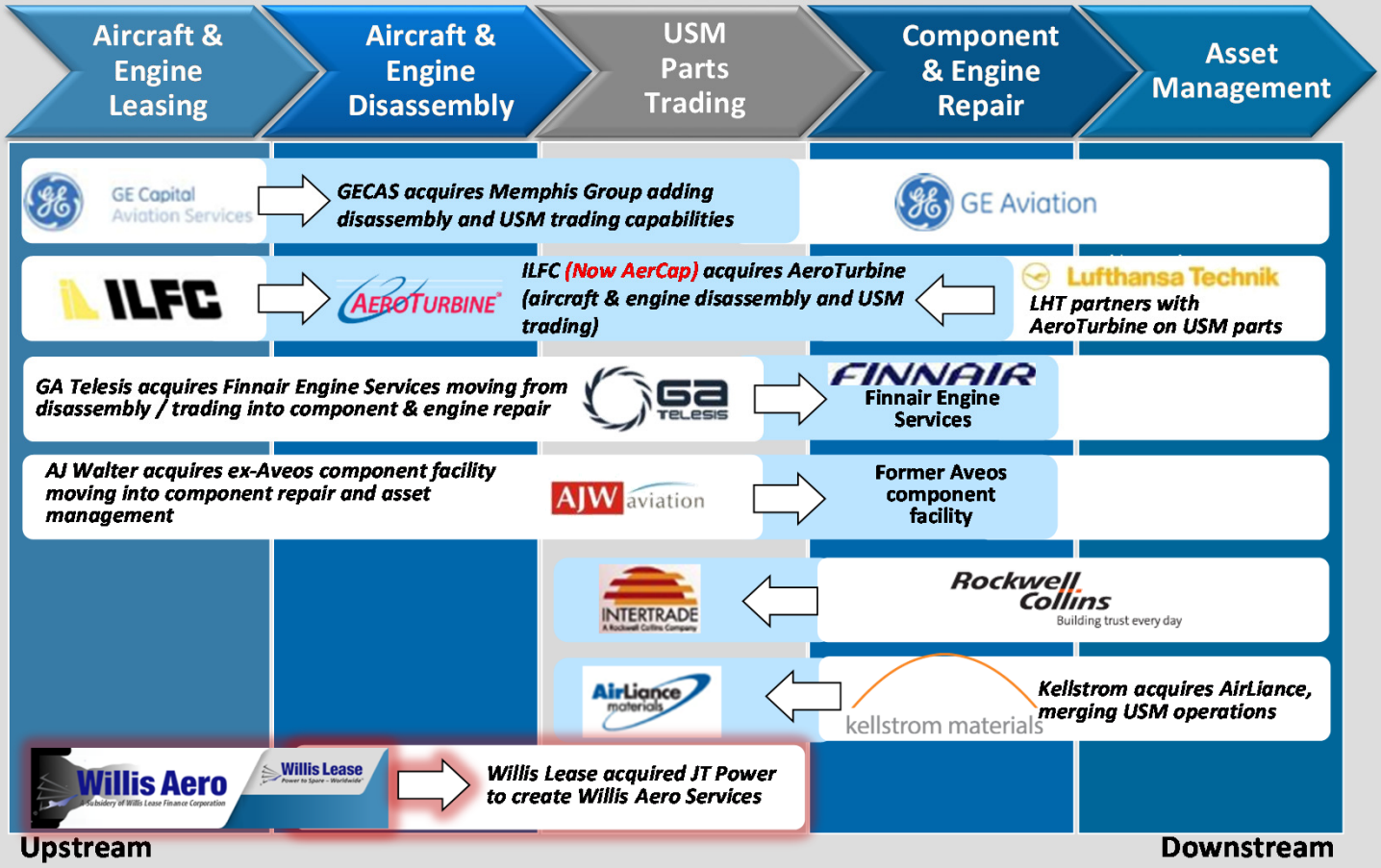


Source: Flight Global ACAS June 2015, CAPA, Airline Monitor, ICF Analysis

…and fueling the growth is a new breed of suppliers with access to capital and newer generation aircraft

Used & Serviceable Material

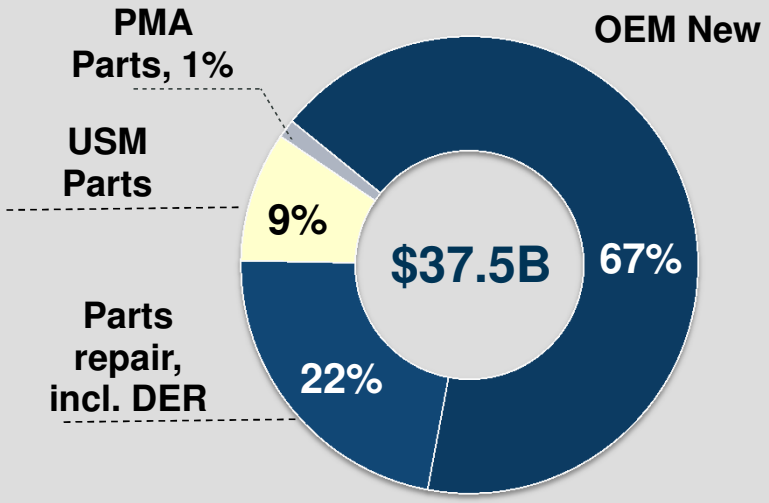
USM Parts Supply Chain Evolution



Source: ICF International

Total commercial aircraft material related spend is estimated to be $37.5B with OEM new parts accounting for about two-thirds

Air Transport MRO Material Related Spend

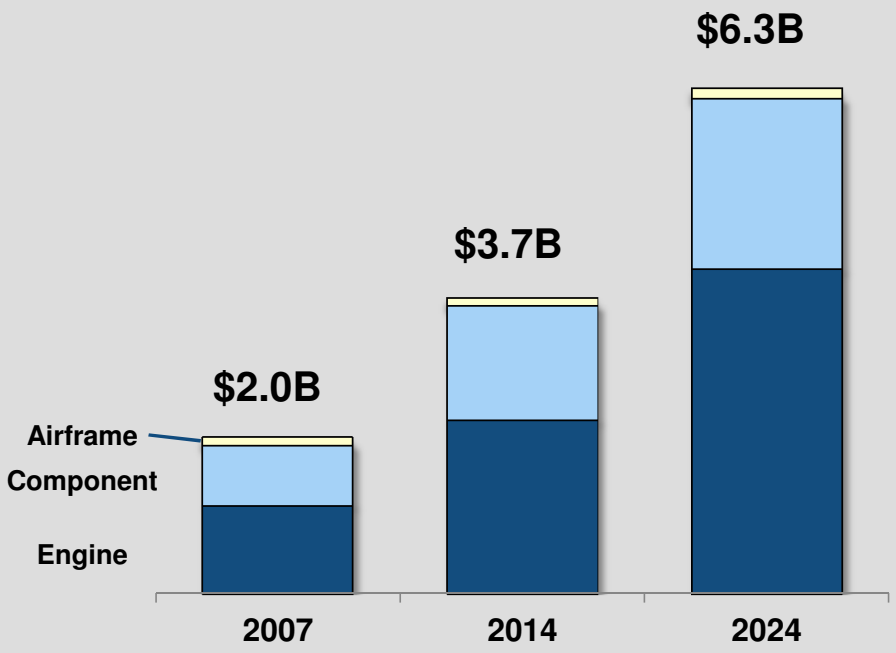


- Alternative (to OEM new) parts choices today account for one-third of total material spend
- USM parts market is $3.5B – and nine times greater than PMA
- Parts repair, including DER, is even higher

Source: ICF International

ICF forecasts the Used & Serviceable Material to grow to $6.3B by 2024 – a 5.5% CAGR

Air Transport USM Market Growth Forecast (Constant 2014 $B)



- Engine USM is expected to be the main driver of growth with anticipated CAGR of 5.9% over the next decade
- Low fuel prices, if sustained for multiple years, could reduce part-outs and the project growth of USM

Source: ICF International; 2024 figures in 2014 constant $

Finally, the dramatic strengthening of the USD is weakening aftermarket results from some regions – including Canada

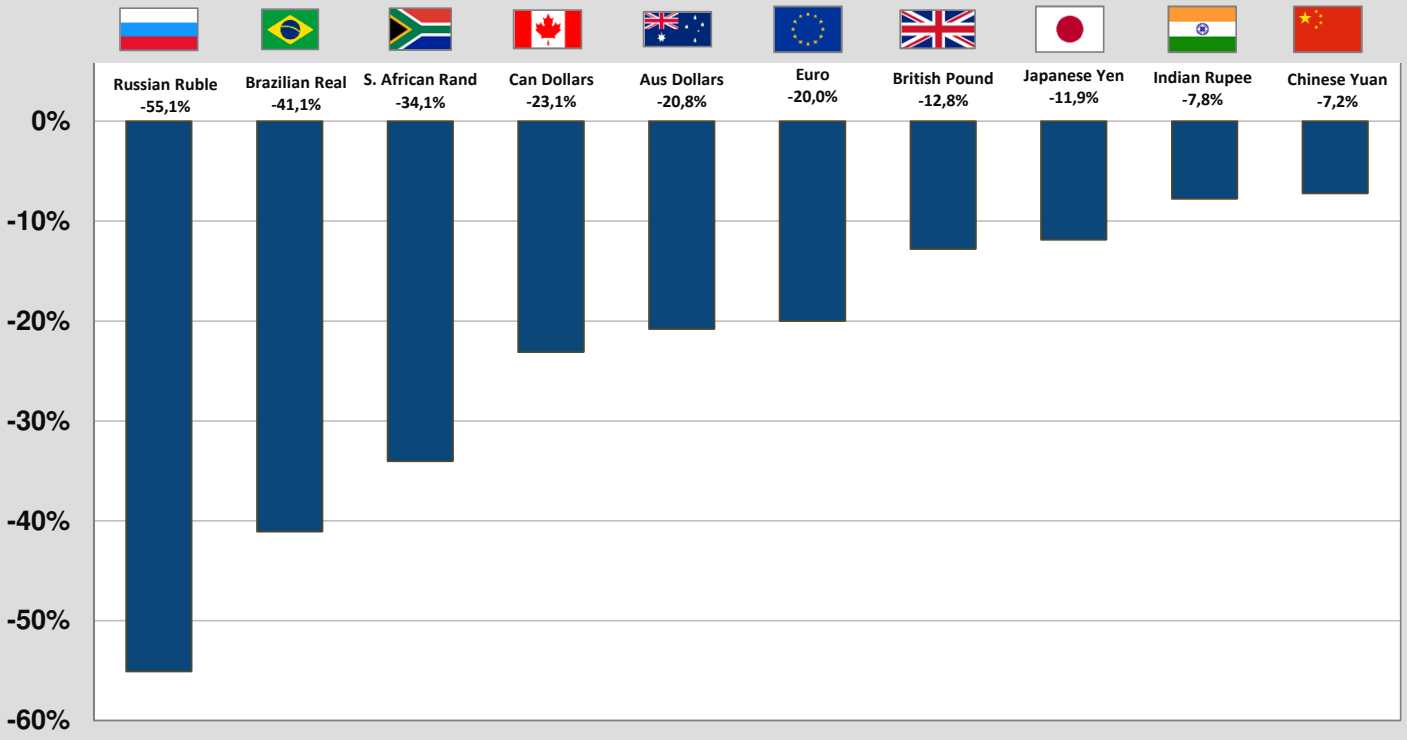
FOREX Impact

- Most MRO materials and many services priced in USD
- Airlines react by conserving cash and maintenance expenditures
- Air Canada's 2015 maintenance cost increased $95M from 2014, mainly due to unfavourable currency impact of $108M

AIR CANADA

Global Currency Exchange Rates vs USD

% Value Change, Jan. 2014 – Jan. 2016



Source: Oanda historical exchange rates, ICF International Analysis

Canaccord Genuity estimates a ~$1B under-performance in 2015 aftermarket part sales

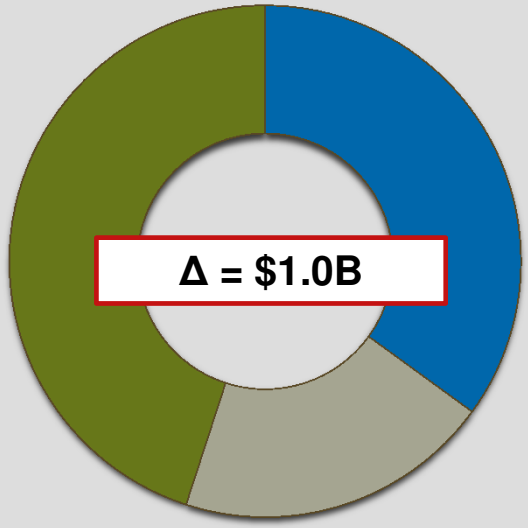
RONA-DRIVEN AIRLINES

New Age Provisioning

Used & Serviceable Material

Currency Fluctuations

Sources Of Air Transport MRO parts sales underperformance of $1B in 2015



Lower initial provisioning on B787 ~35%

Airline MRO cost management ~45%

Aircraft cannibalization / USM usage ~20%

Source: Canacccrd Genuity

MRO
ENTRETIEN • RÉPARATION • RÉVISION
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FAIRE DU MRO AU CANADA

April 28, 2016
Montréal

THANK YOU!

For questions regarding this presentation, please contact:

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