

A photograph of an airplane wing and tail against a cloudy sky. The wing is white with a blue stripe along the leading edge. The tail is white with a blue stripe. The sky is blue with white clouds.

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MRO Industry Analysis and Forecast





Today's Agenda

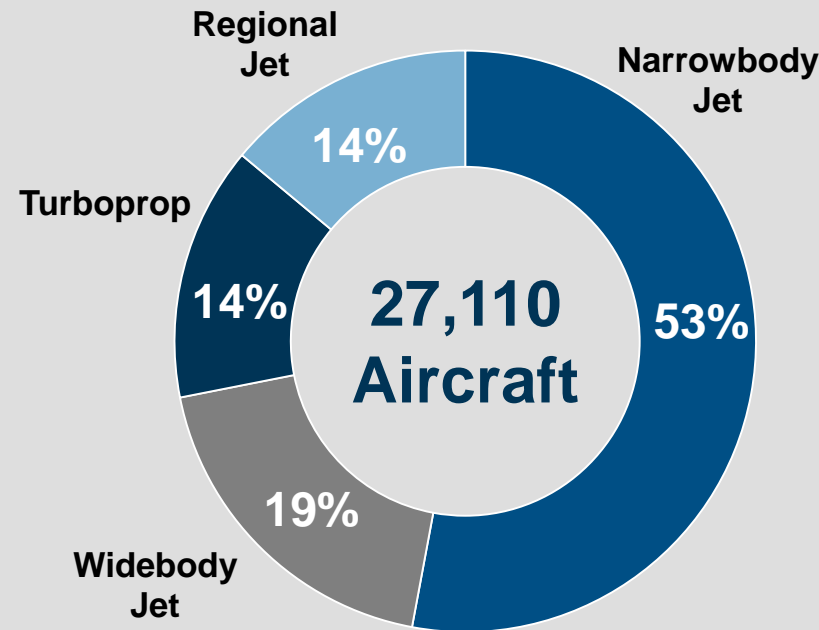
- ⚙ **MRO Forecast**
- ⚙ **New Technology Aircraft Impact**
- ⚙ **Industry Context**
- ⚙ **Implications**

MRO Forecast

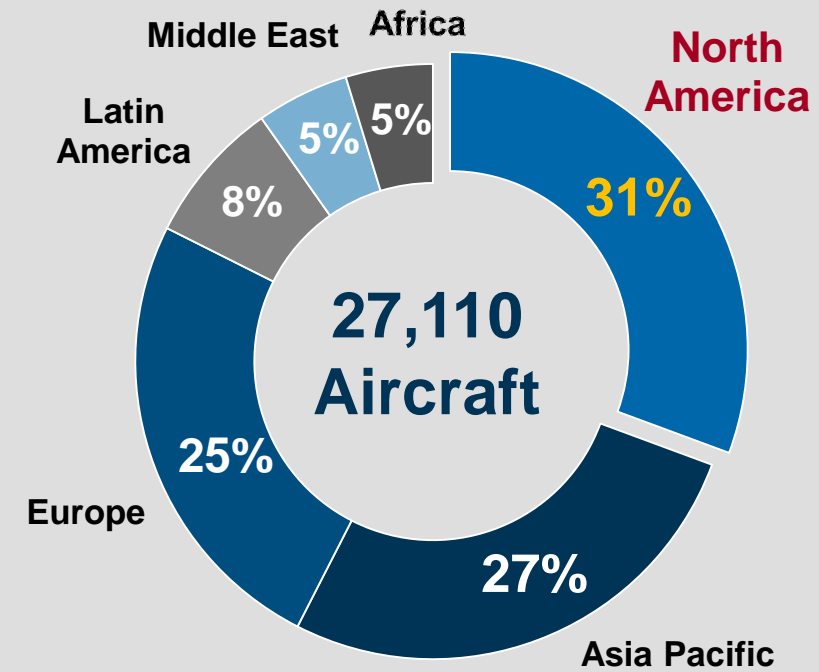


The current commercial air transport fleet consists of over 27,000 aircraft

2015 Global Commercial Air Transport Fleet



By Aircraft Type

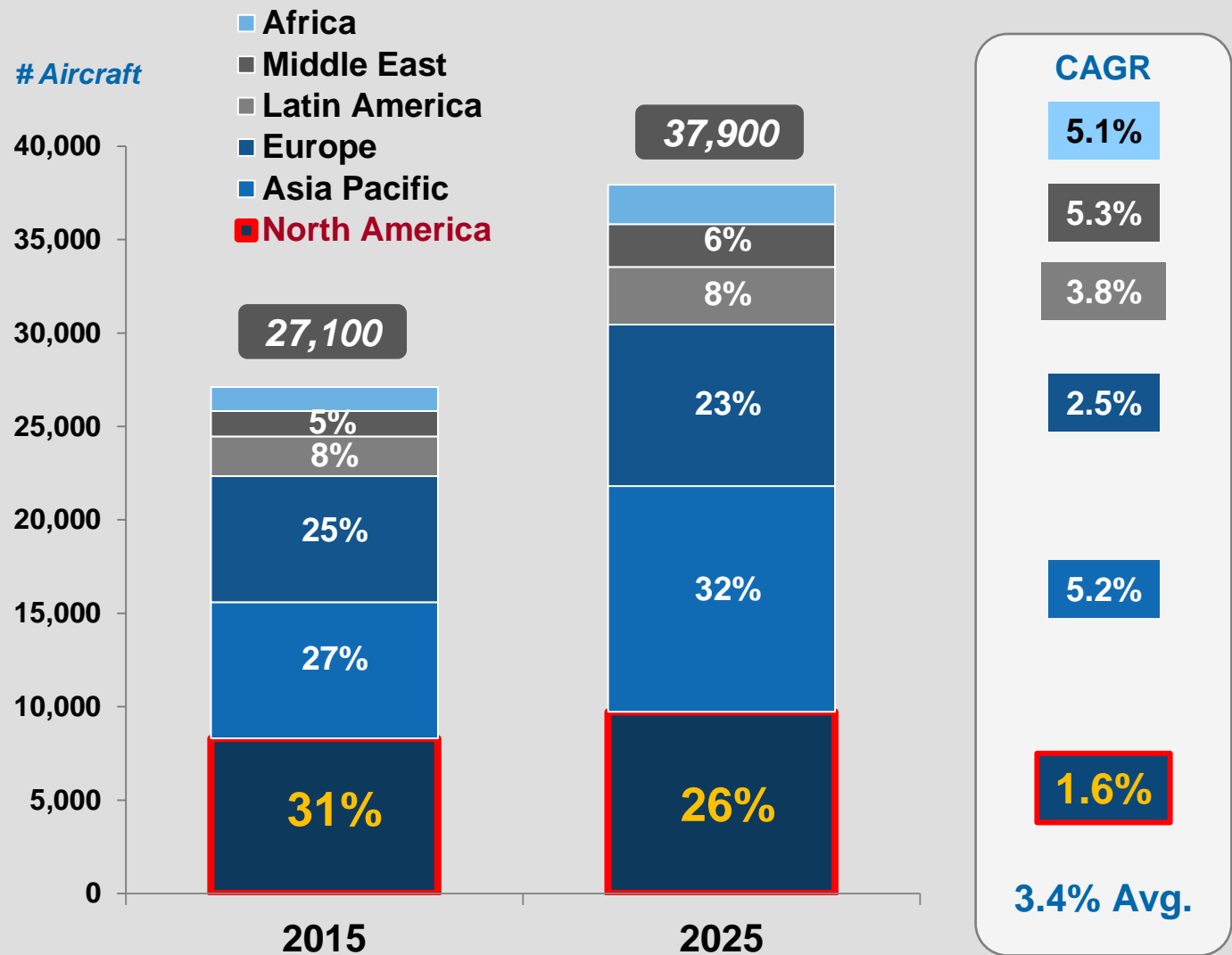


By Global Region

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

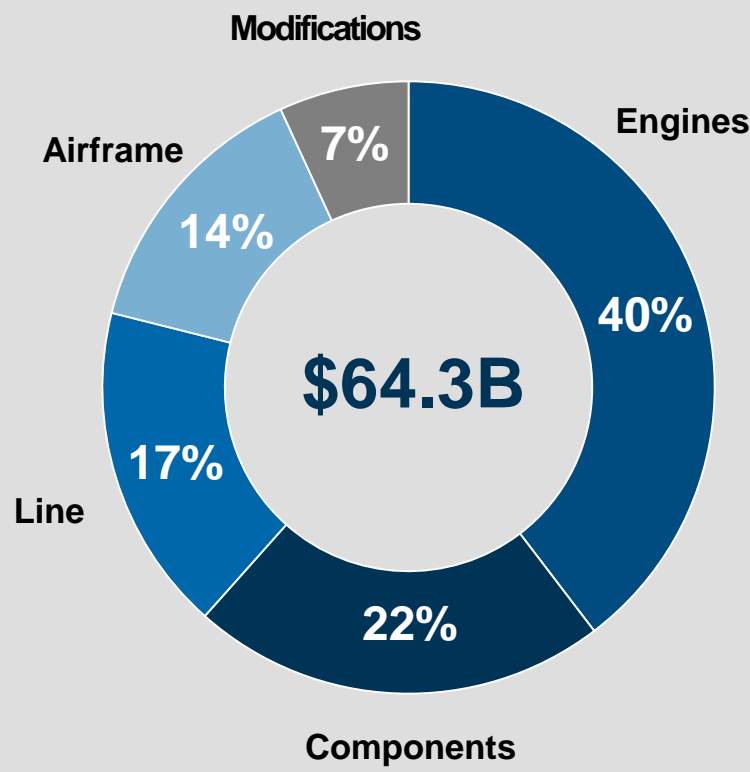
10 Year Global Air Transport Fleet Growth



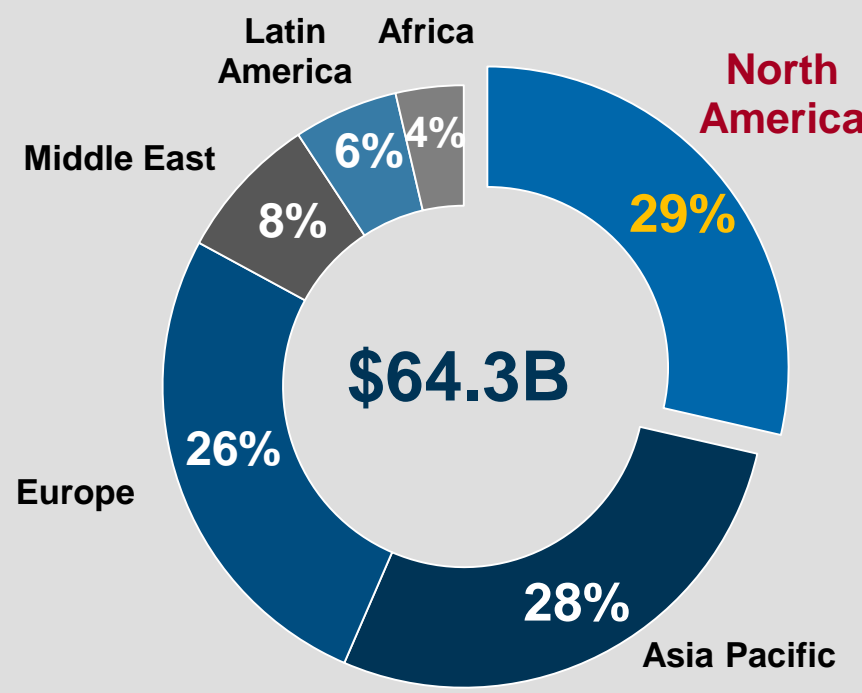
Source: ICF International, CAPA 2015

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

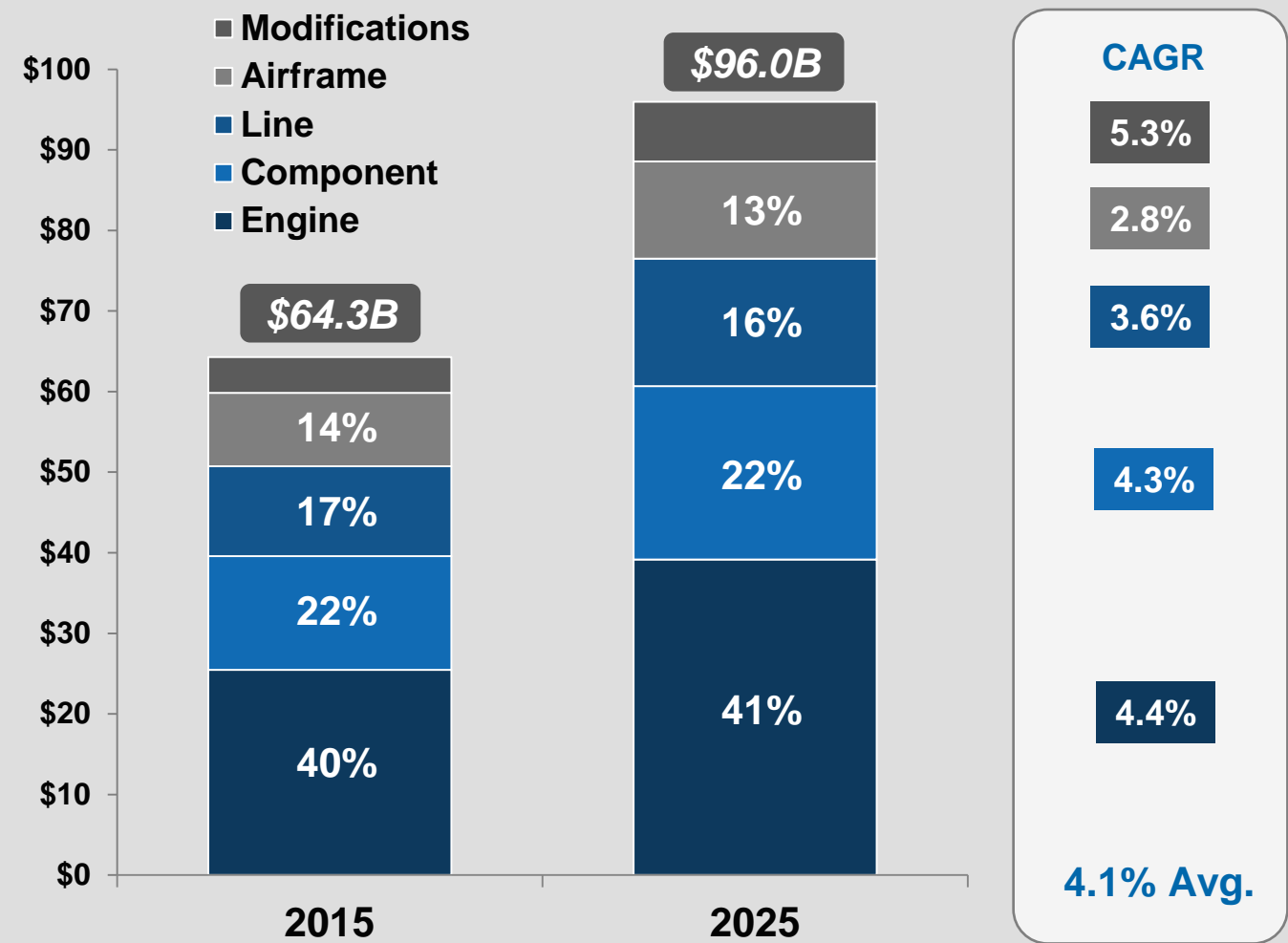


By Global Region

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



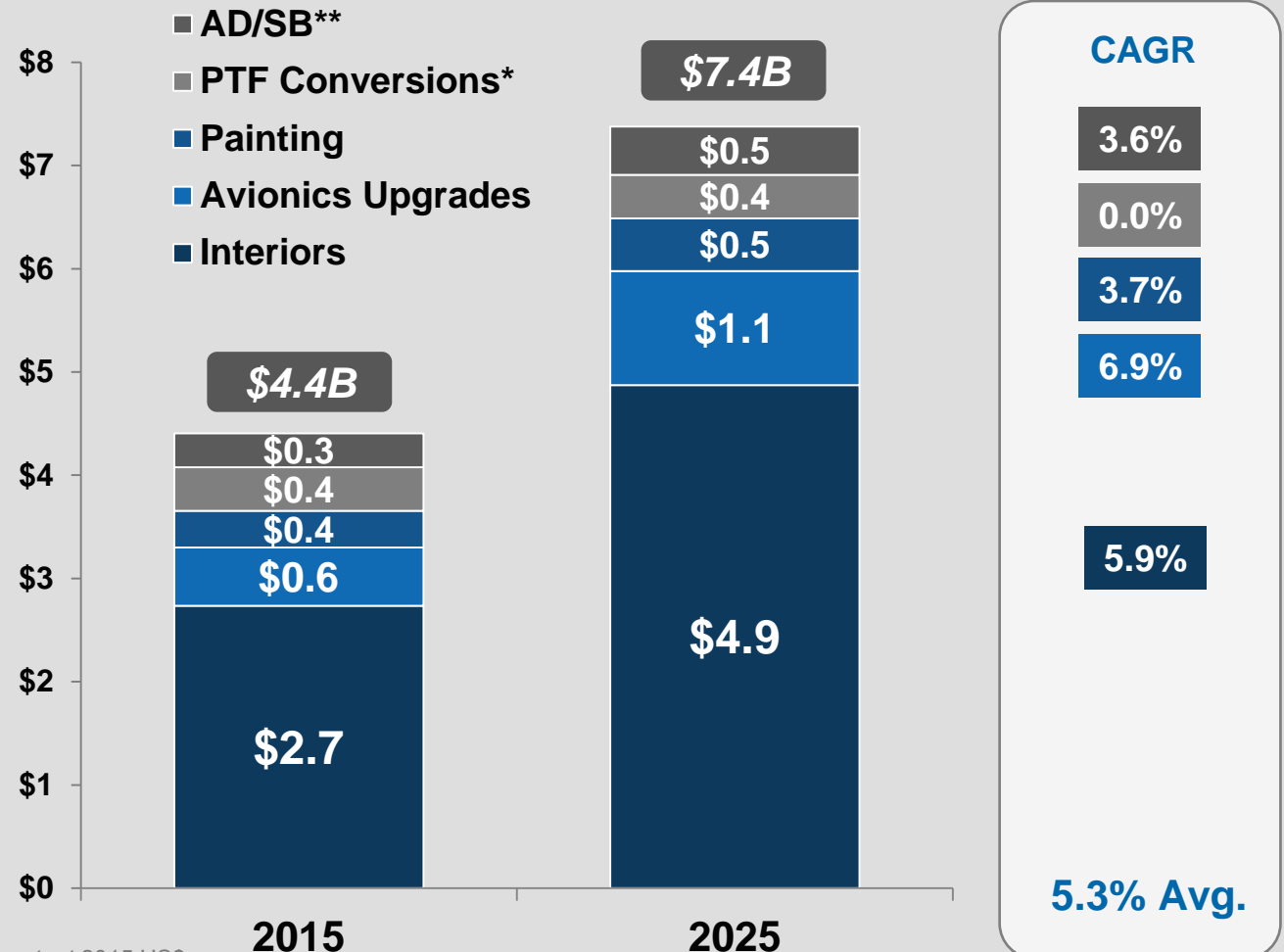
Source: ICF International; Forecast in 2015 \$USD, exclusive of inflation

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

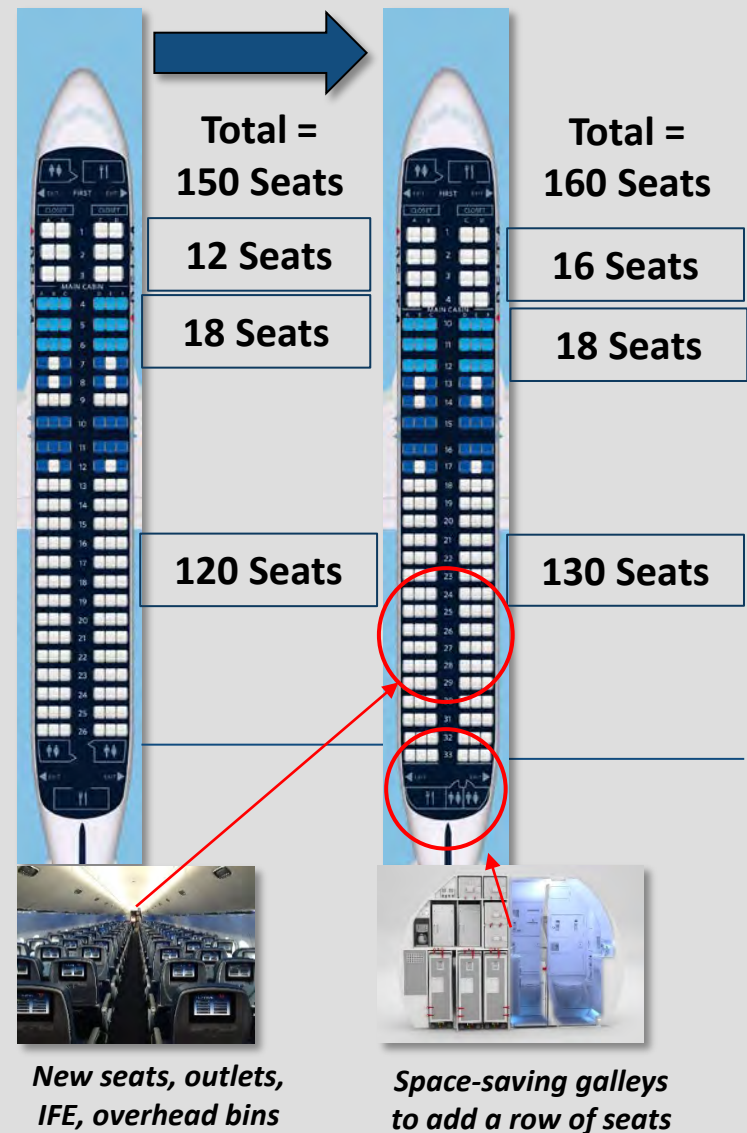
Air Transport Modifications Forecast, 2015–2025
(\$USD Billions)



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

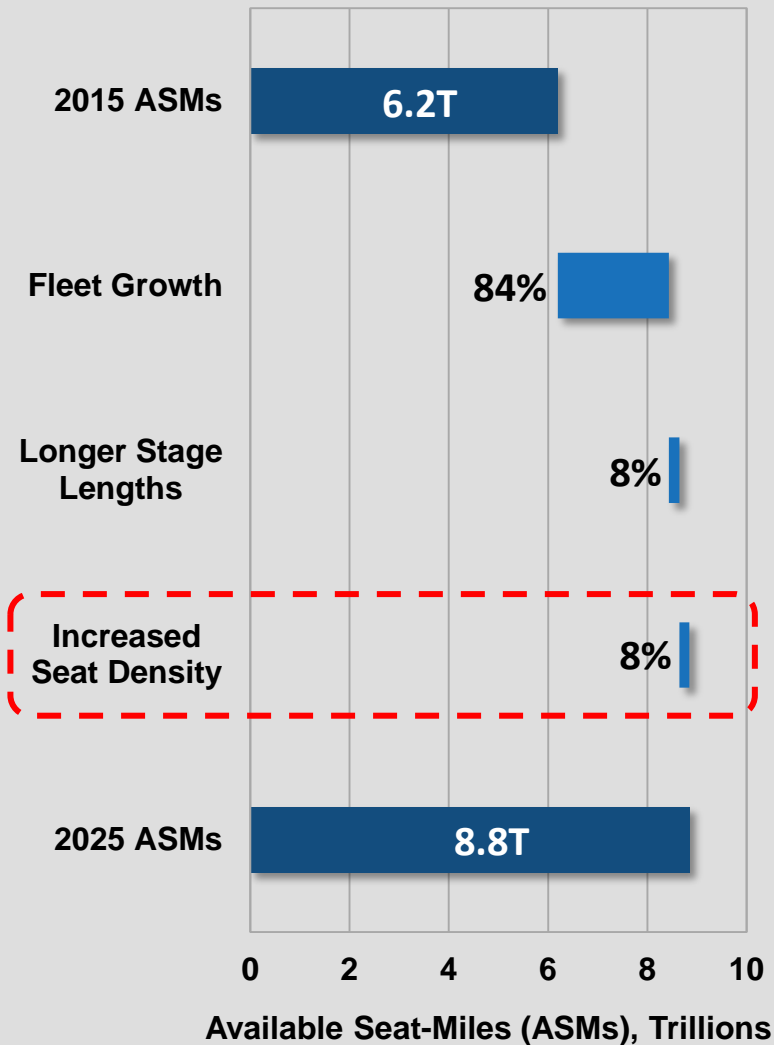
Cabin modifications - including new slim line seats and fixtures - have enabled capacity up-gauging & and cabin “*densification*”, driving lower unit cost and facilitating bottom line growth

Delta A320 Interior Modification Program Overview



Source: ICF Analysis, Delta

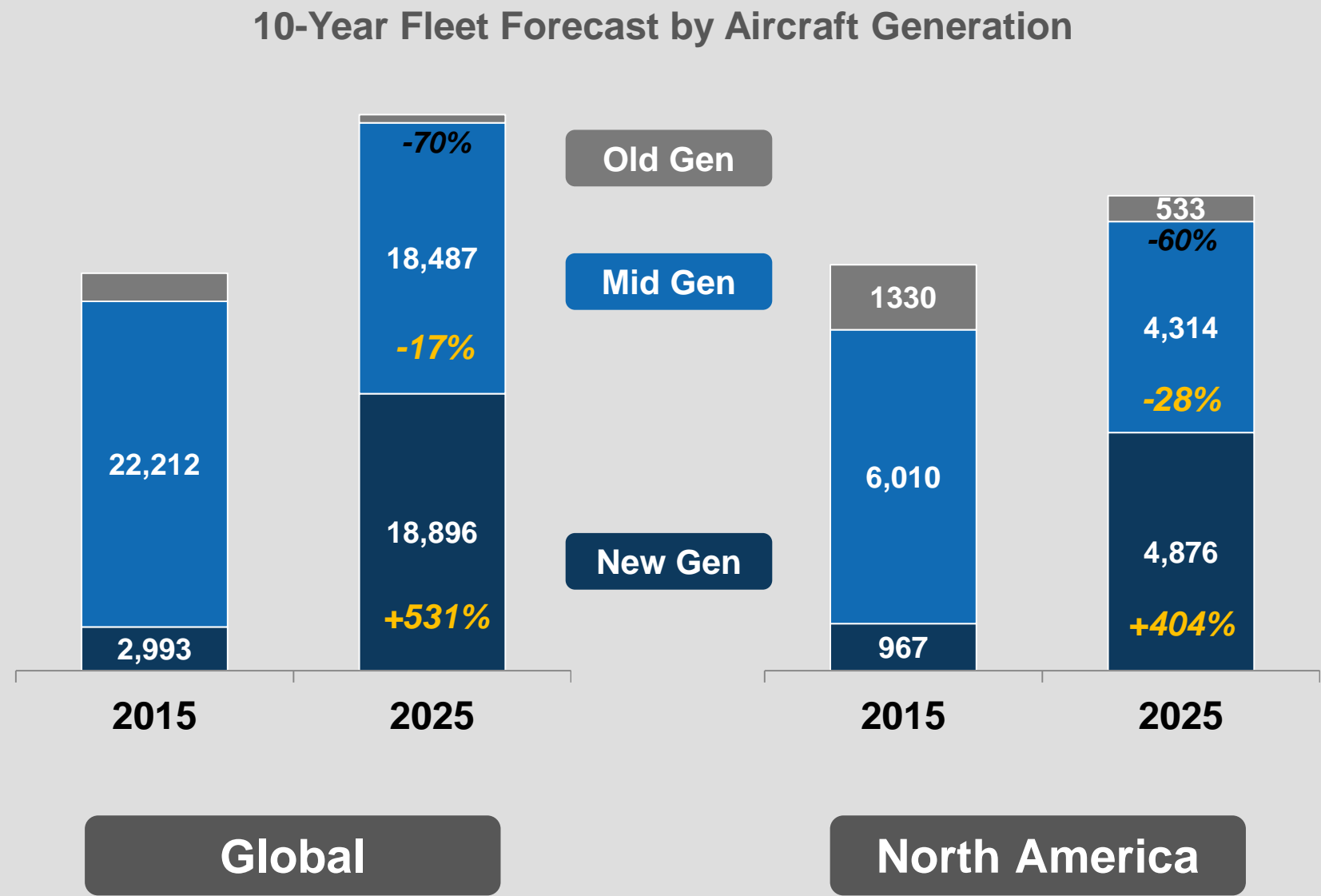
2015 - 2025 Capacity Bridge, by Contributing Factor



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

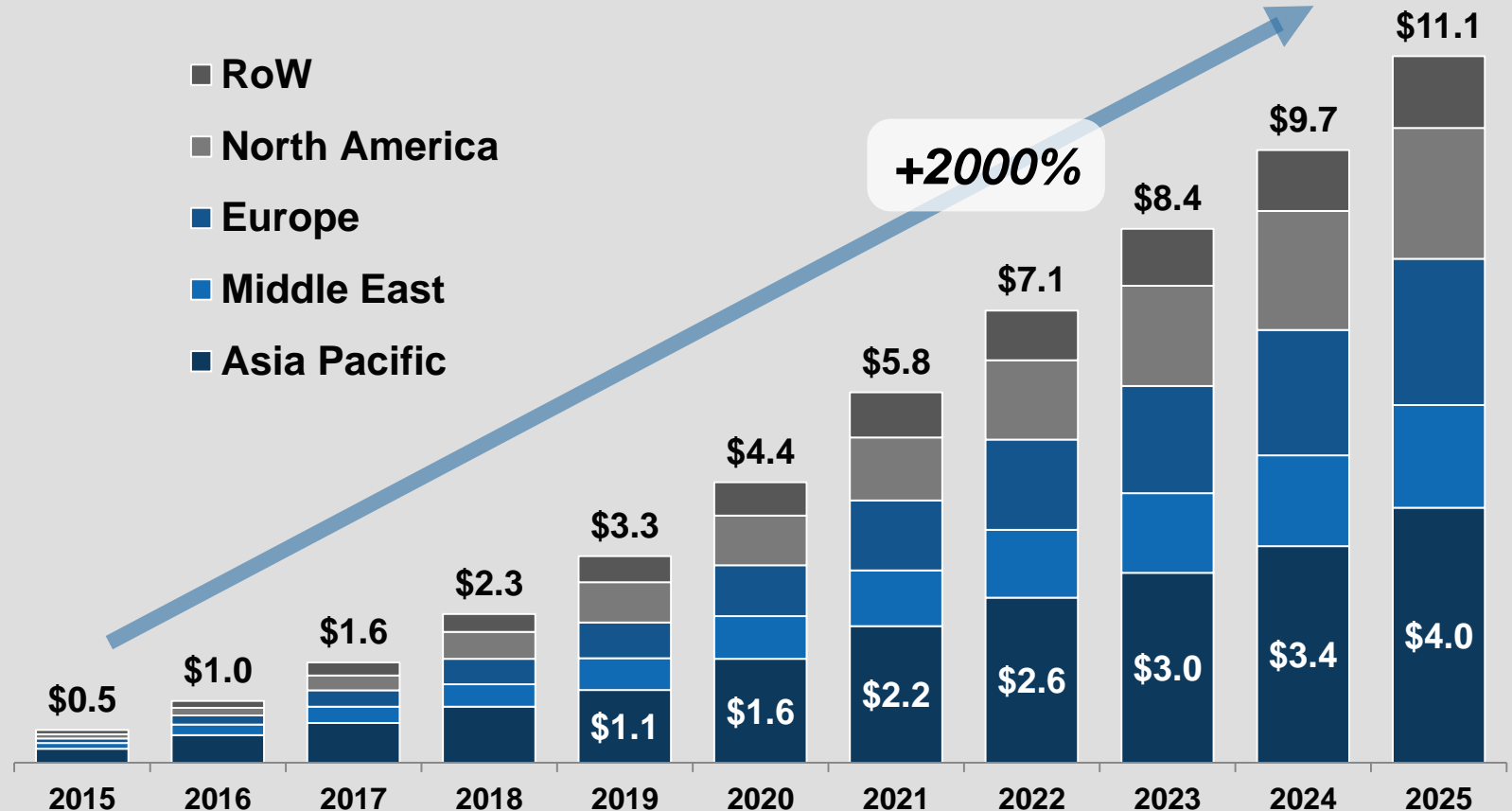


Source: ICF International
Old Gen: 727, 737 Classic, 747 Classic, DC10, L1011, A300
Mid Gen: 757, 767, 747-400, A320 Family, A330/A340, 737NG, 777, ERJ, CRJ
New Gen: 777X, 787, A350, A330neo, A380, E170/175/190/195, CRJ-7/9/1000, 737MAX

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!

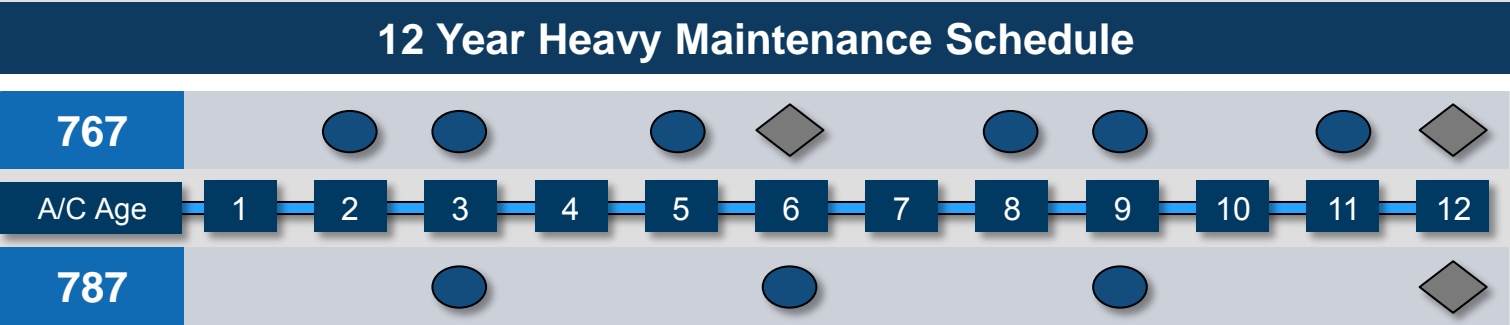
10-Year MRO Spend for New Technology A350 and 787 Aircraft
\$ USD Billions



New technology aircraft challenge traditional MRO sourcing strategies

Return on investment challenges:

- Facilities
- Tooling & Equipment
- Training
- IT Systems



● = Light C-Check ◆ = Heavy C-Check

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

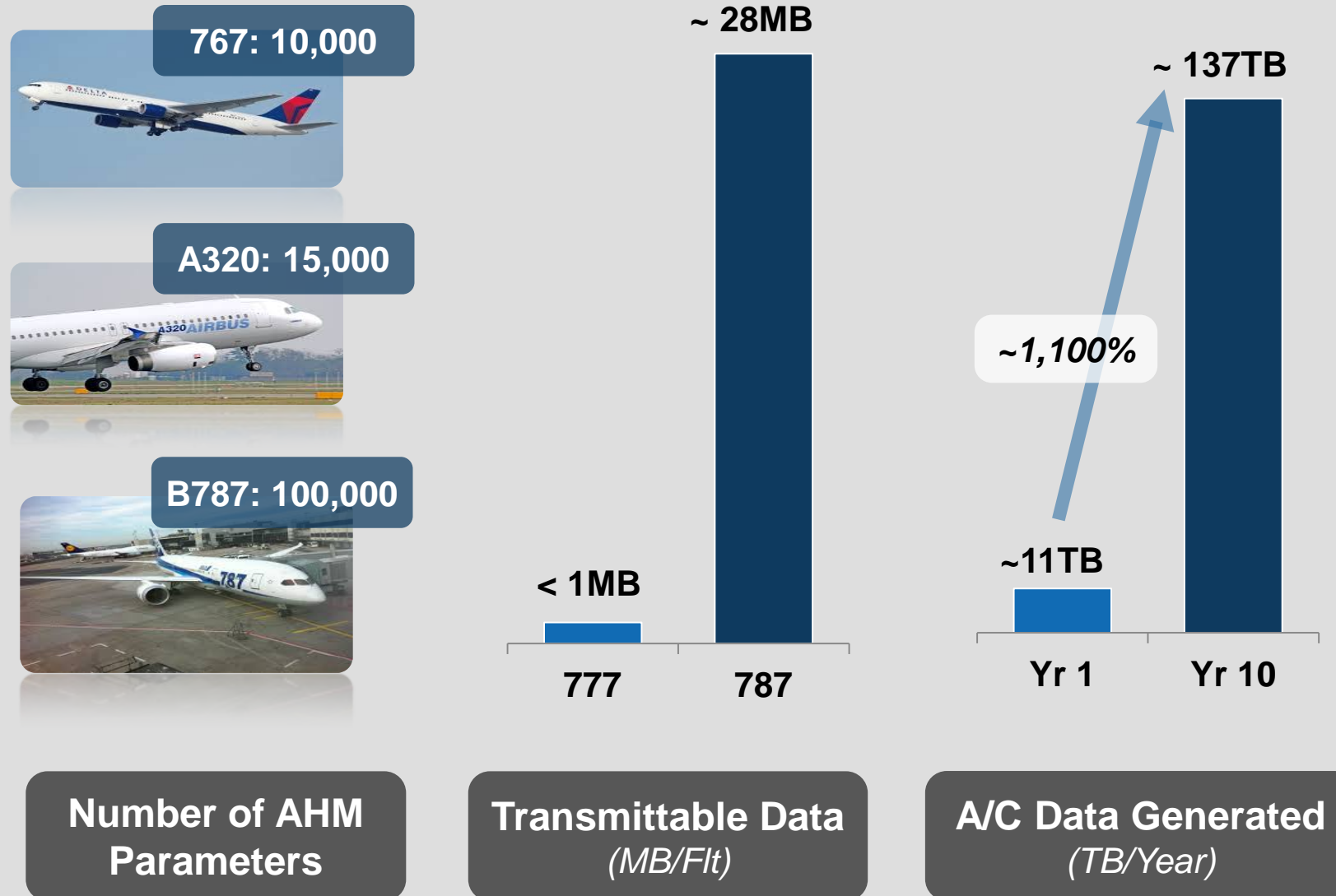
*Based on 4,000 FH/yr utilization
767 C-check = 18mo, 4C = 72mo; 787 C-check = 36mo, 4C = 144mo
Assumed industry standard labor man-hour rate
Aircraft out of Service (AooS) calculated for C/4C/8C checks assuming industry standard MRO hangar productivity

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

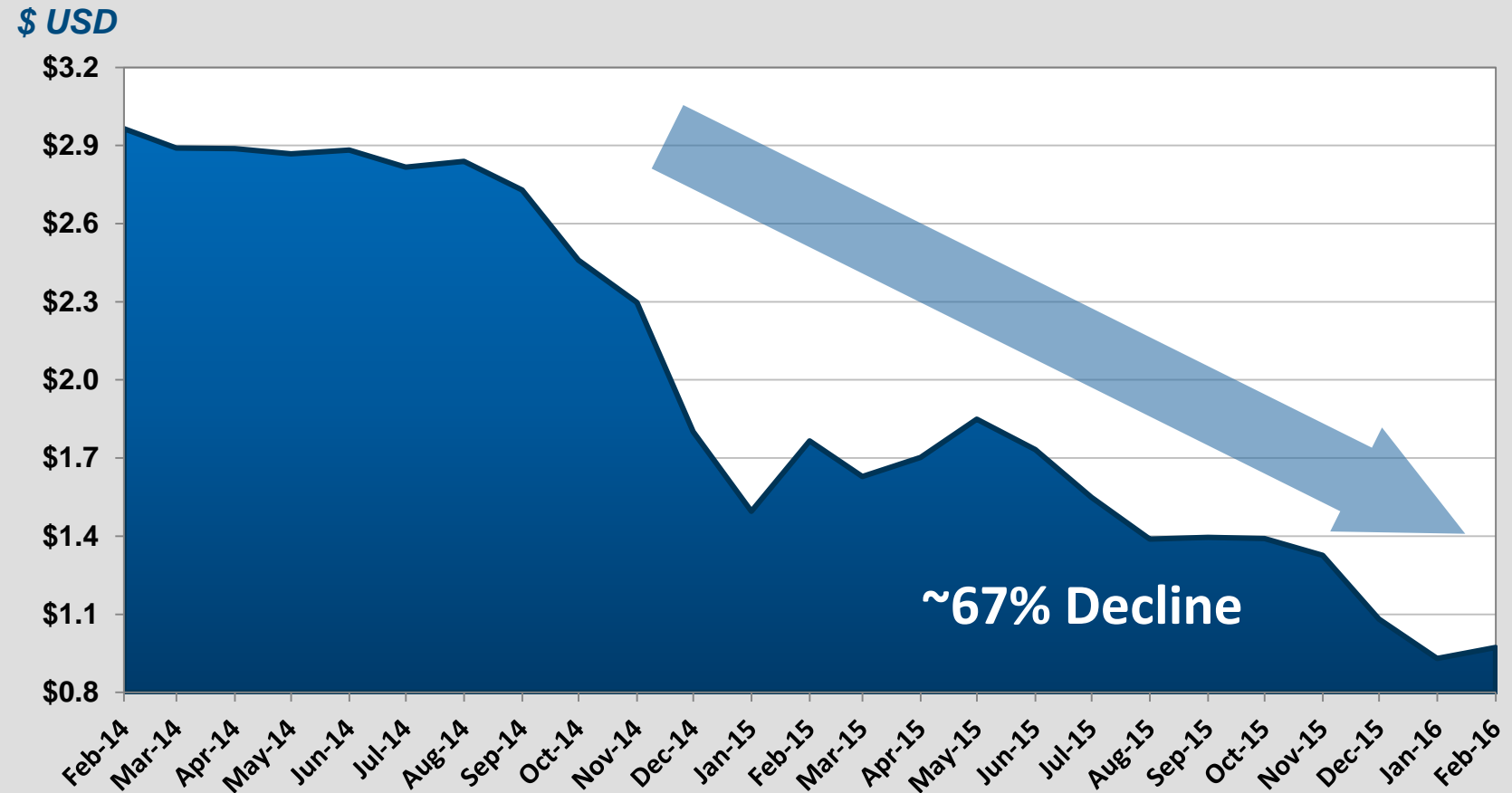


Industry Context...



Continued low fuel costs are having, and will have, important repercussions for aviation and the MRO supply chain

U.S. Gulf Coast Jet Fuel Price per Gallon

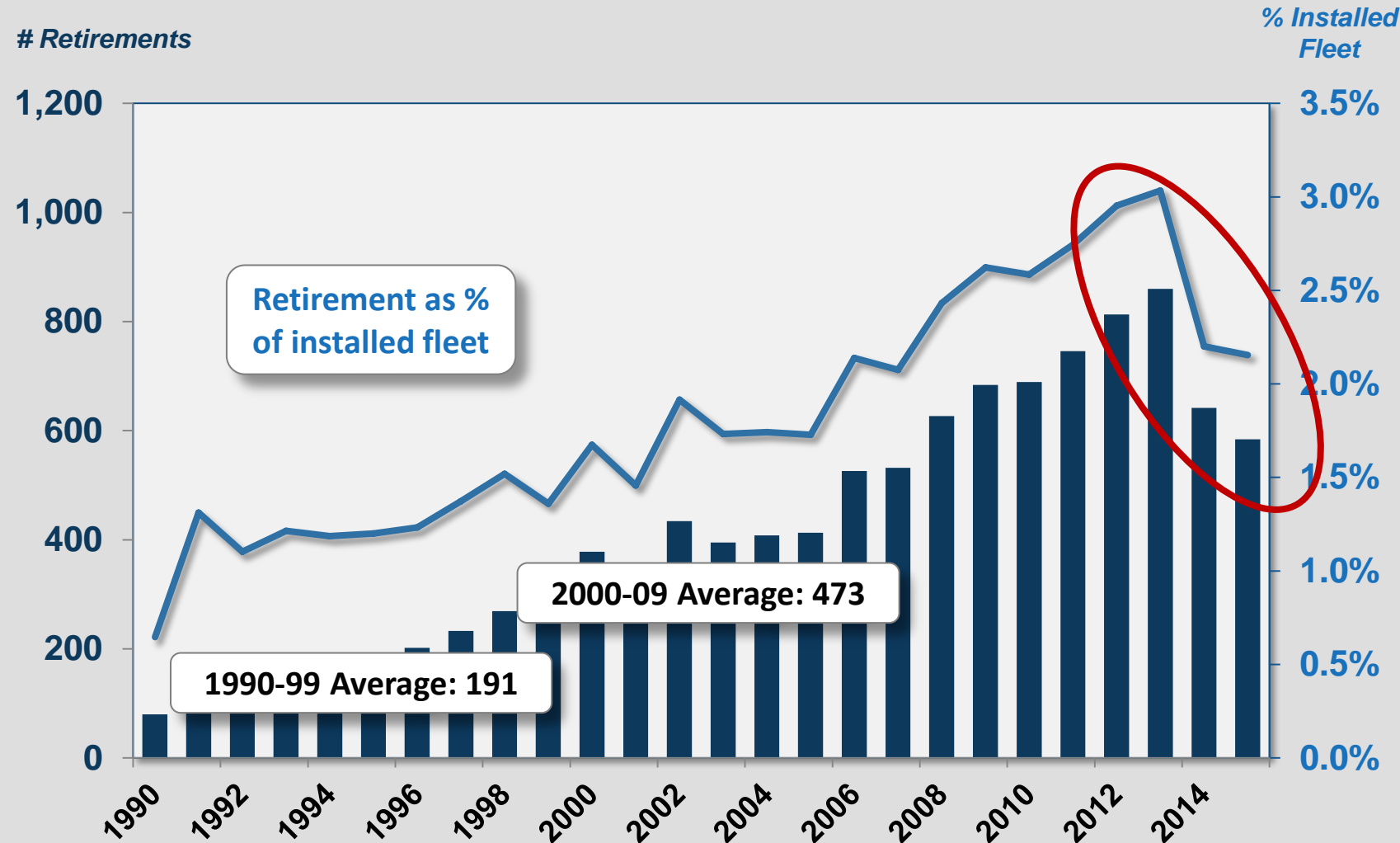


...such as an already visible drop in aircraft retirements

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

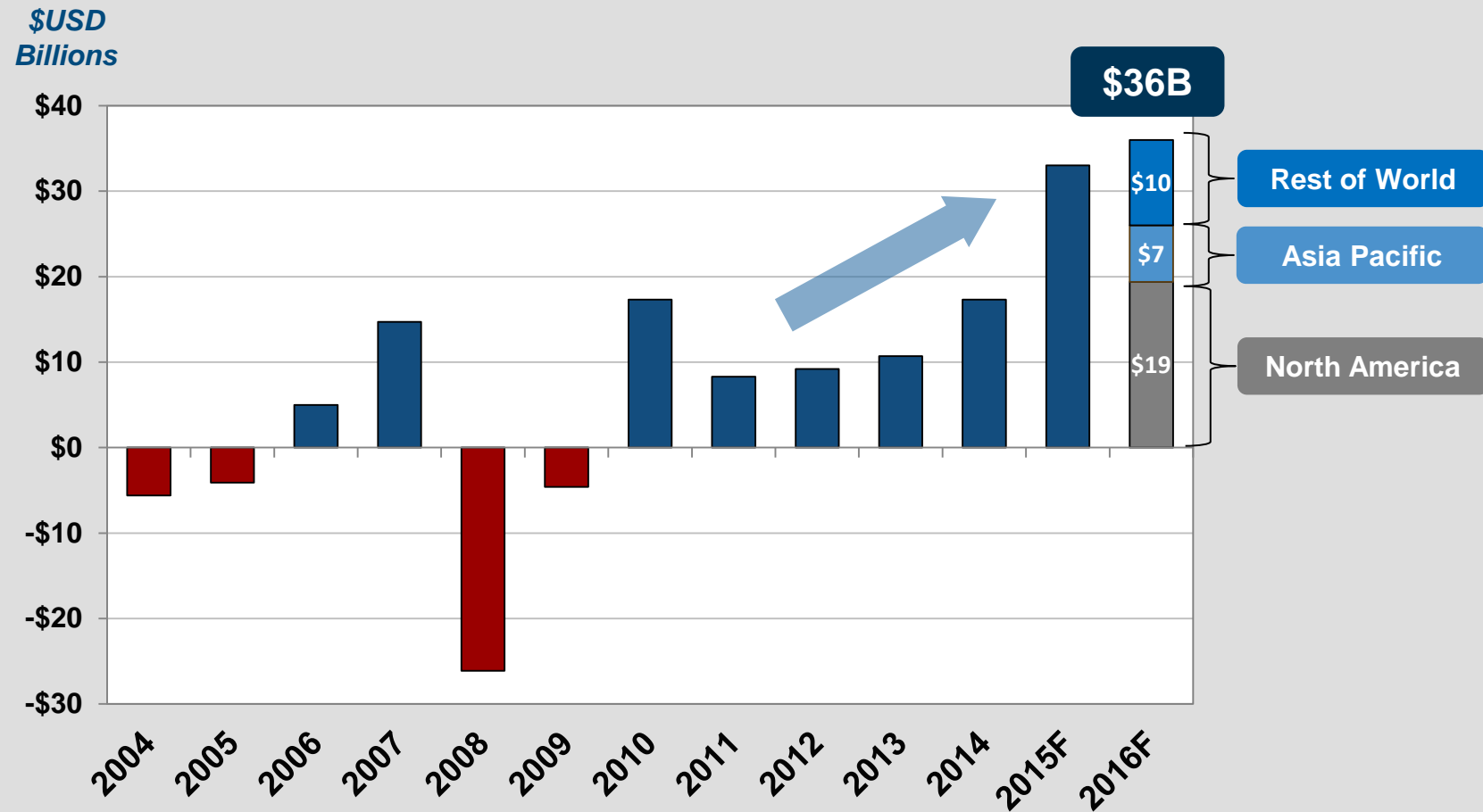
Commercial Air Transport Annual Aircraft Retirements



Partially thanks to low fuel prices, North American airlines today are enjoying record profitability

Some other regions continue to struggle – why?

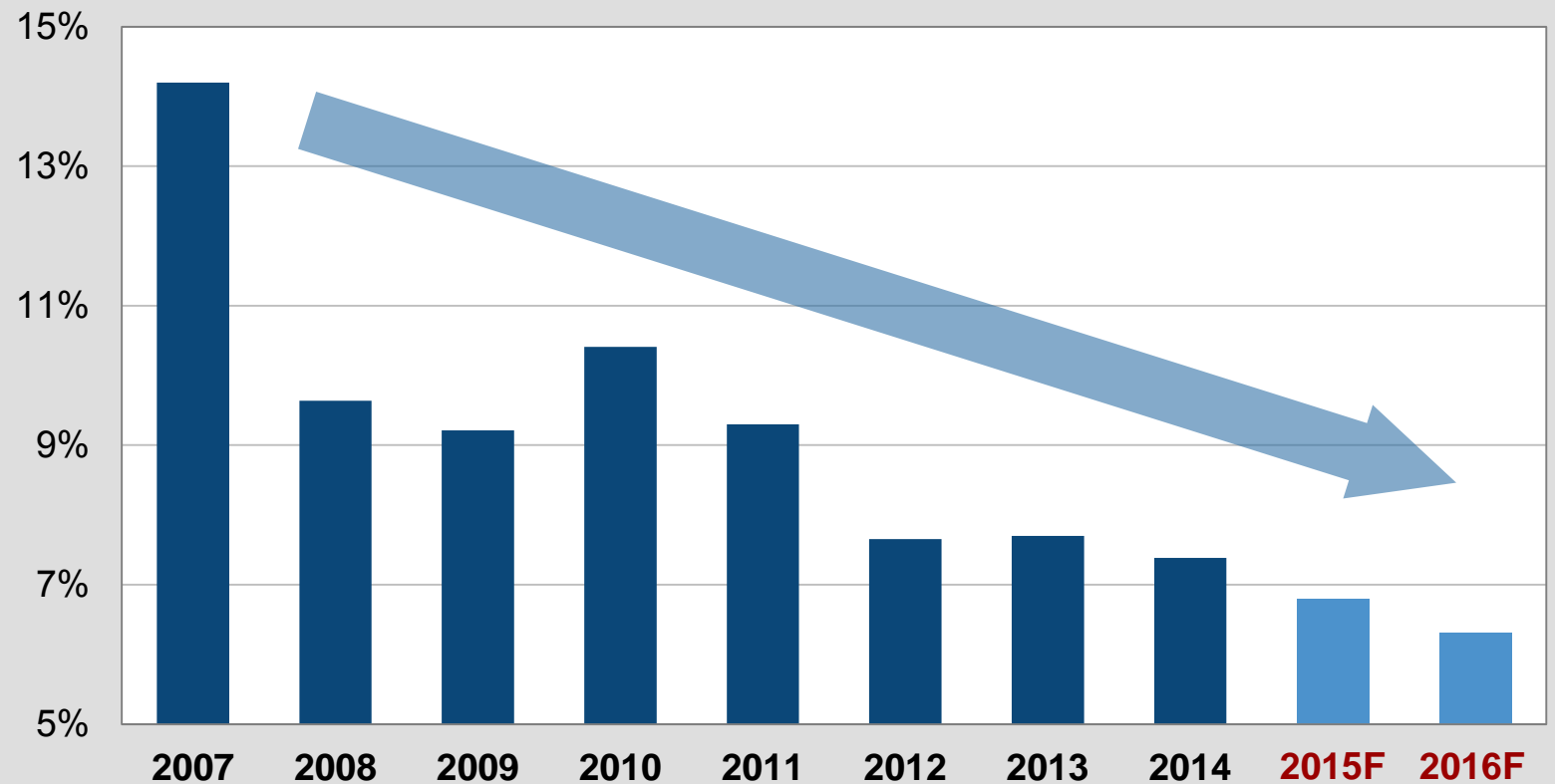
Global Airline Profitability, 2004-2016



China's seemingly insatiable demand for global commodities was a key driver of global economic growth...

...But now, after years of remarkable GDP growth, China's economy has been steadily slowing

China GDP Year-on-Year Growth (%)



China's situation exacerbated the 54% fall in commodity prices in the past five years...

...which has had a dramatic impact on economies dependent on commodity exports

Dow Jones Commodity Indices (DJCI)
(January 2011 Indexed to 100)



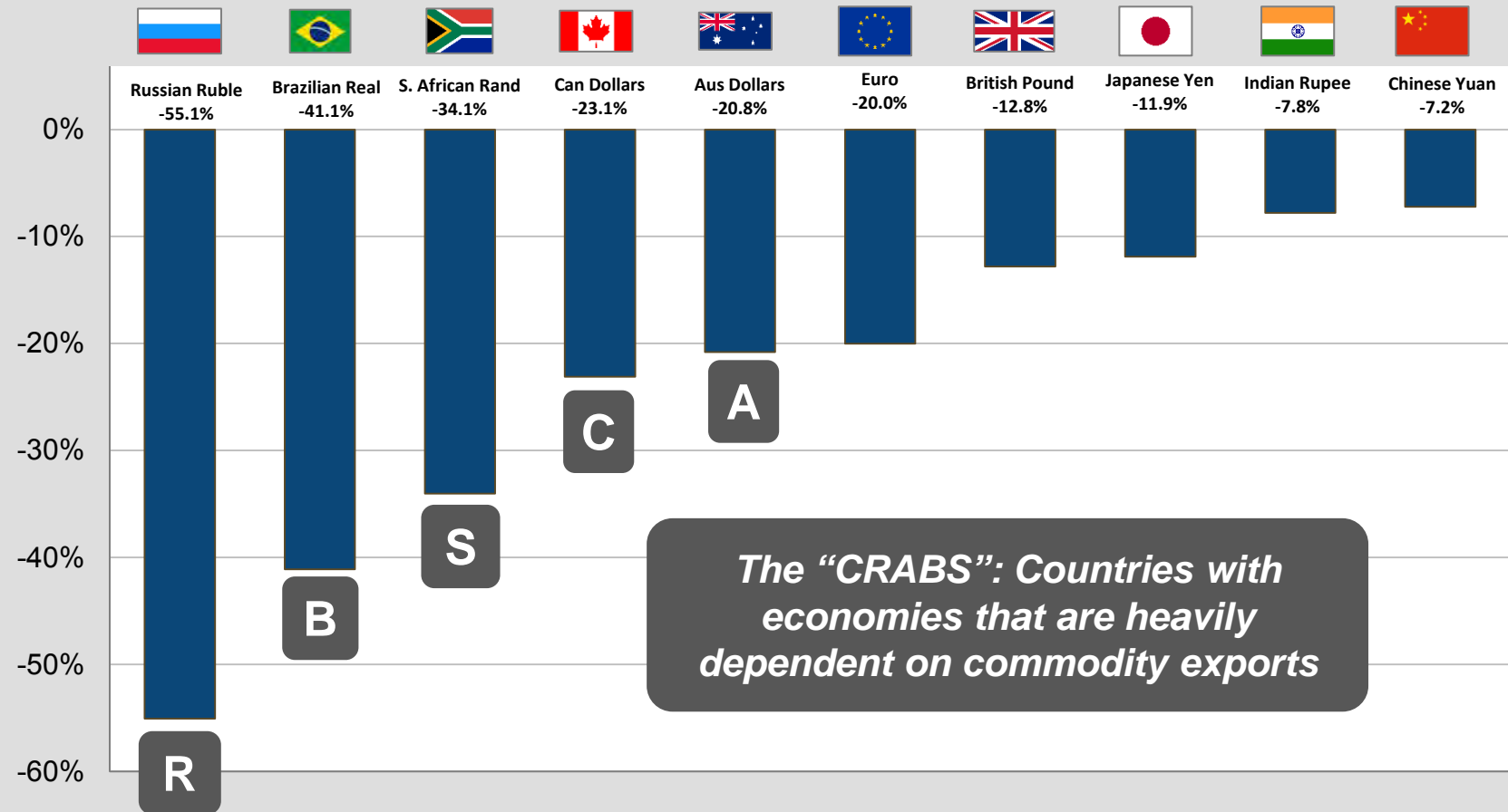
The increase in oil & gas market supply and reduced demand for commodities has led to a stronger US Dollar

FOREX Impact

- Partially offsets the positive impact of low fuel costs
- Increases the cost of dollar based parts and materials / flying hour agreements
- Buying/leasing aircraft becomes more expensive

Global Currency Exchange Rates vs USD

% Value Change, Jan. 2014 – Jan. 2016



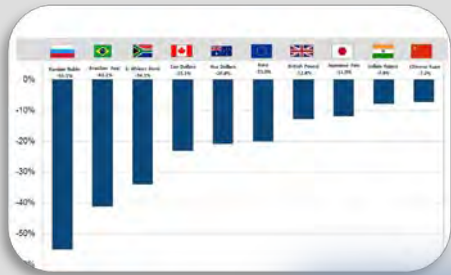
Implications for Debate



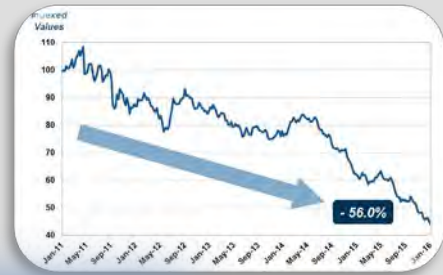
Whilst uncertainty - driven by four key industry factors - has yet to impact the backlog materially, cancellations and deferrals will be vital harbingers of airline and supply chain confidence and outlook

Implications of Industry Outlook....

Exchange Rates

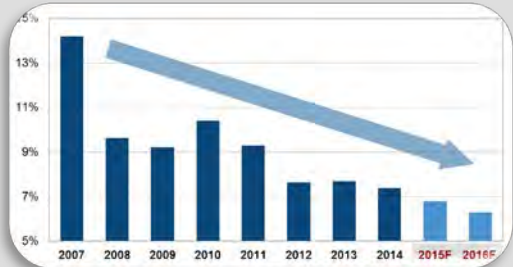


Commodity Prices

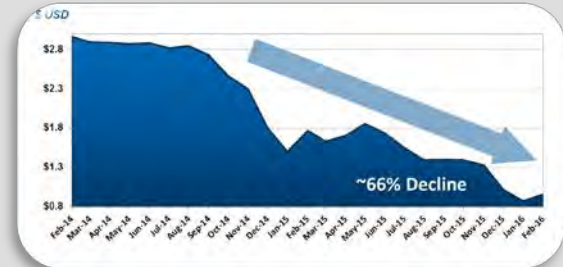


Order deferrals and/or cancellations?

China



Fuel Price



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....





In Conclusion...

- **The MRO market outlook remains robust with expected growth of 3.4% per annum**
- **The combined impact of low fuel prices, exchange rates and some regional economic weaknesses is creating some uncertainty**
- **The very rapid ramp up of New Technology Aircraft is creating both new challenges and opportunities aviation and MRO stakeholders**
- **...and is having a significant impact on the competitive landscape**



AVIATION WEEK 
MRO
AMERICAS
April 5-7, 2016
Dallas, Texas

THANK YOU!

For questions regarding this presentation, please contact:

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