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MRO Market Update & Industry Trends





Today's Agenda



MRO Forecast



Latin American Aviation Outlook



Trend Watch:

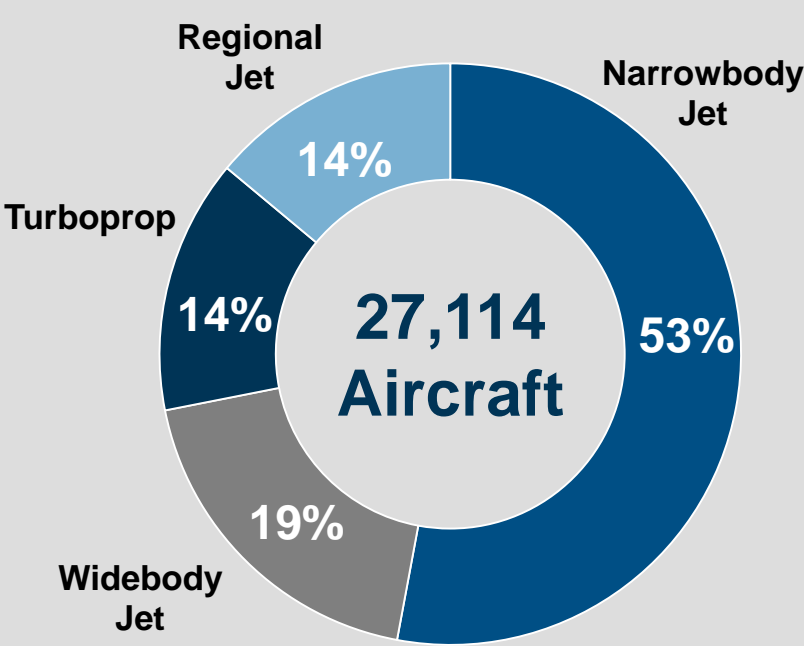
- ***The Mod Squad***
- ***New Technology Aircraft***
- ***MRO Investment in Latin America***

MRO Forecast

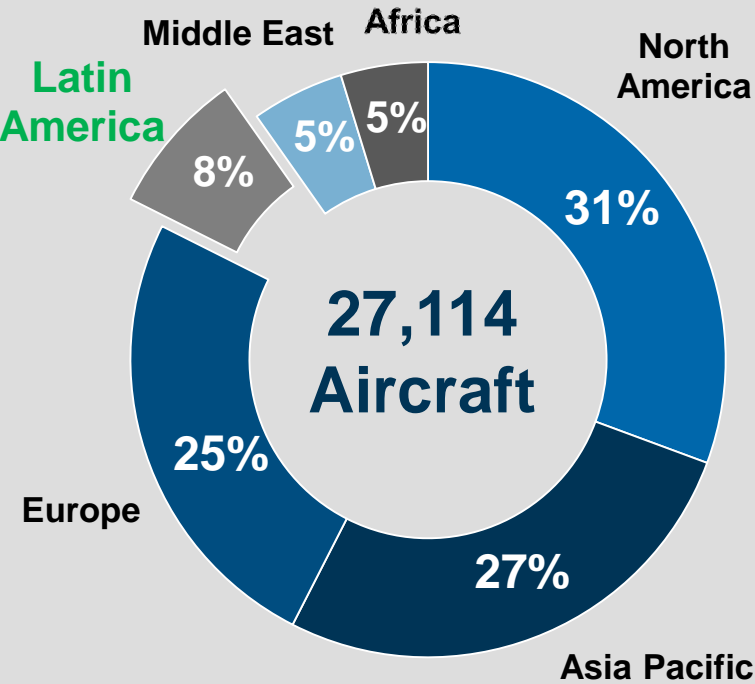


The current commercial air transport fleet consists of over 27K aircraft; over half are narrowbody aircraft

2015 Global Commercial Air Transport Fleet

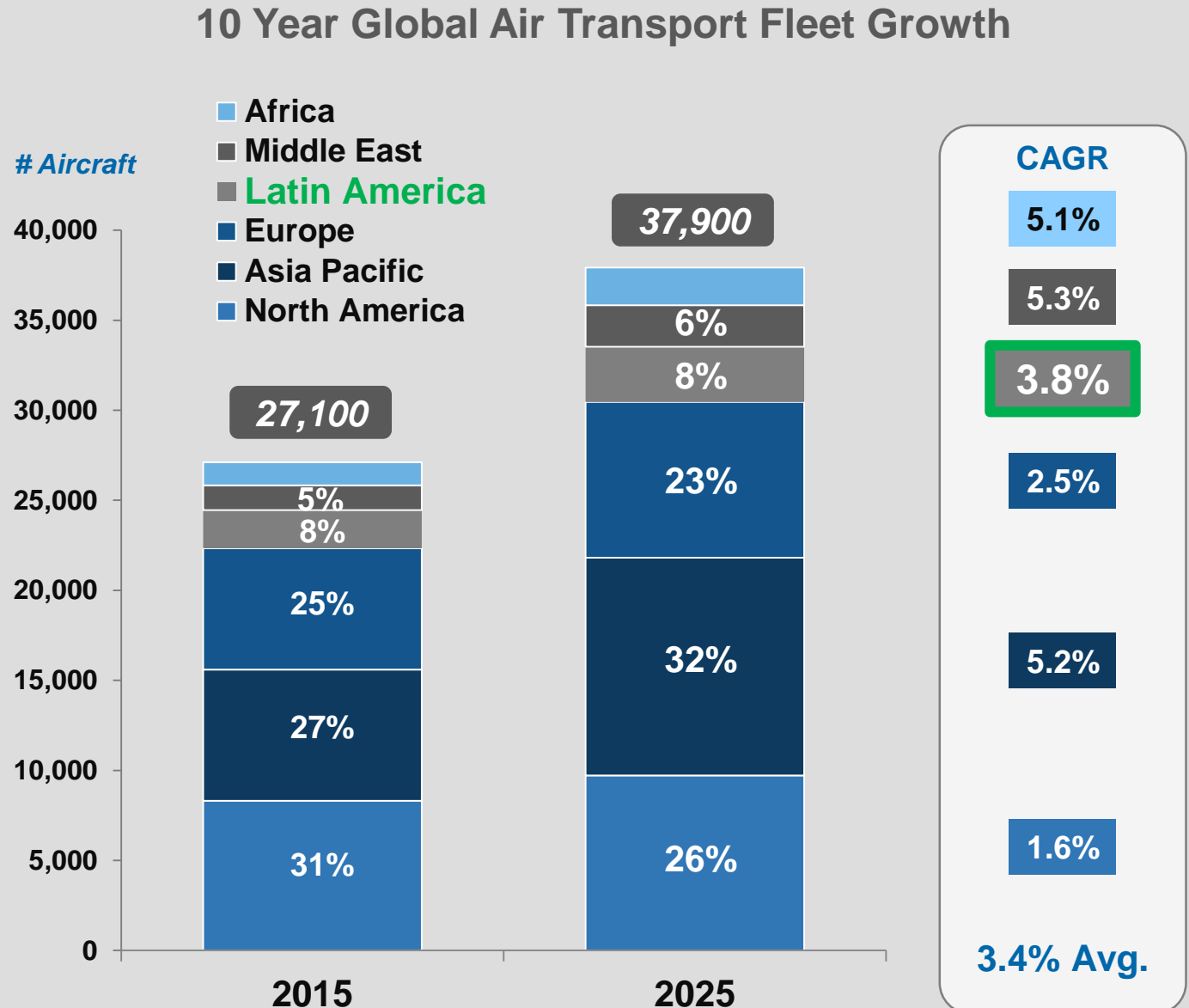


By Aircraft Type



By Global Region

The combination of strong air travel demand and the need to replace ageing aircraft will drive fleet growth at a healthy 3.4% annually

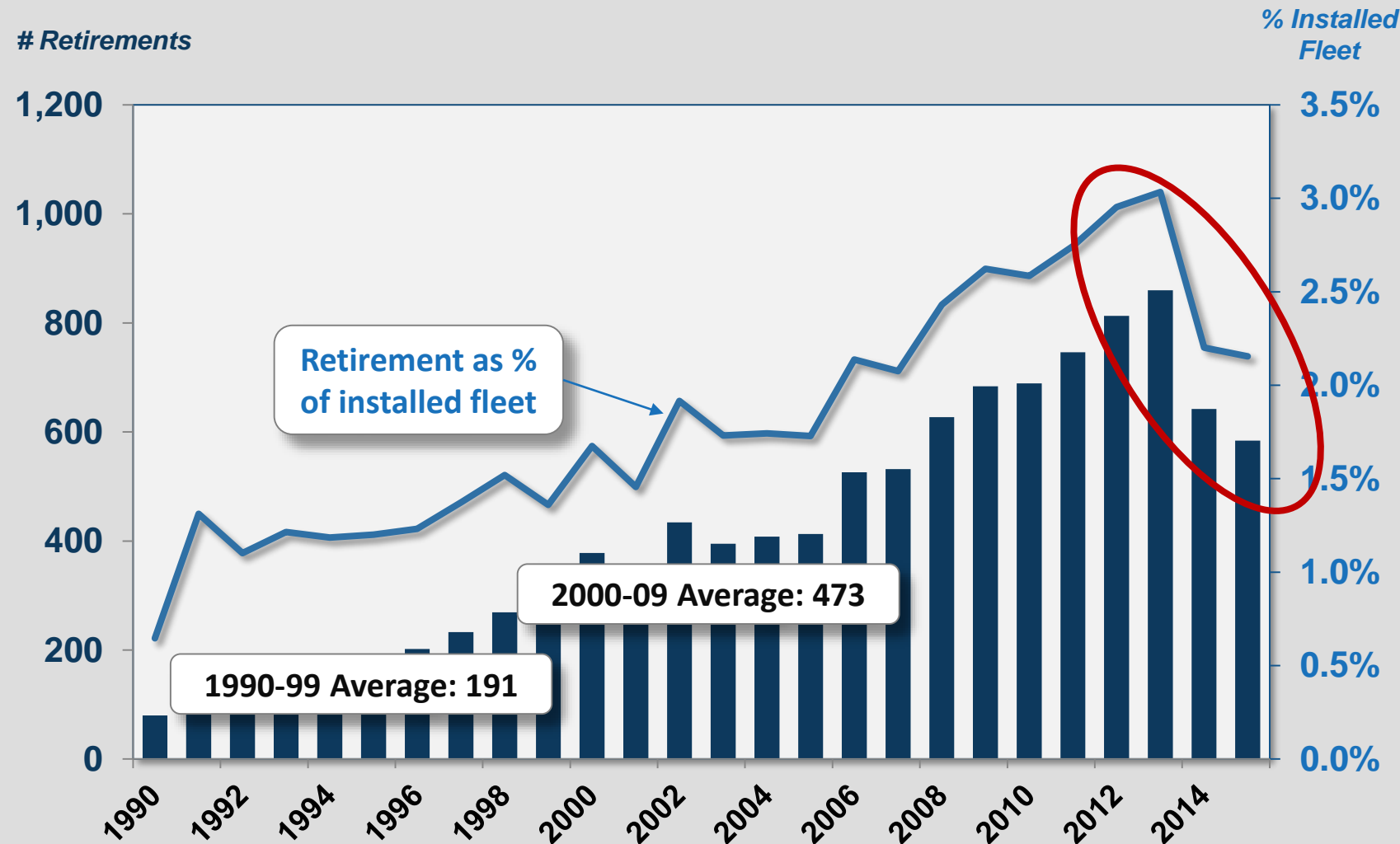


Continued low fuel costs could reverse aircraft retirements trends

Potential Impact:

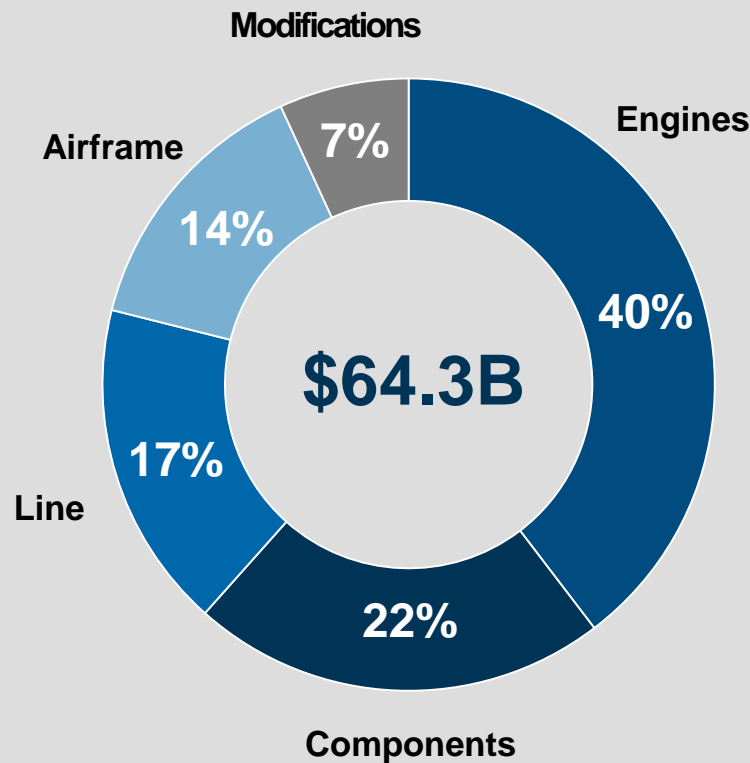
- **MRO Suppliers:** Increased spend on older airframes & engines
- **Surplus Market:** Reduced part-out “feed stock”
 - OEMs: Improved new part sales
 - Distributors: Improved used part values / pricing
 - Operators: Increased material costs

Commercial Air Transport Annual Aircraft Retirements

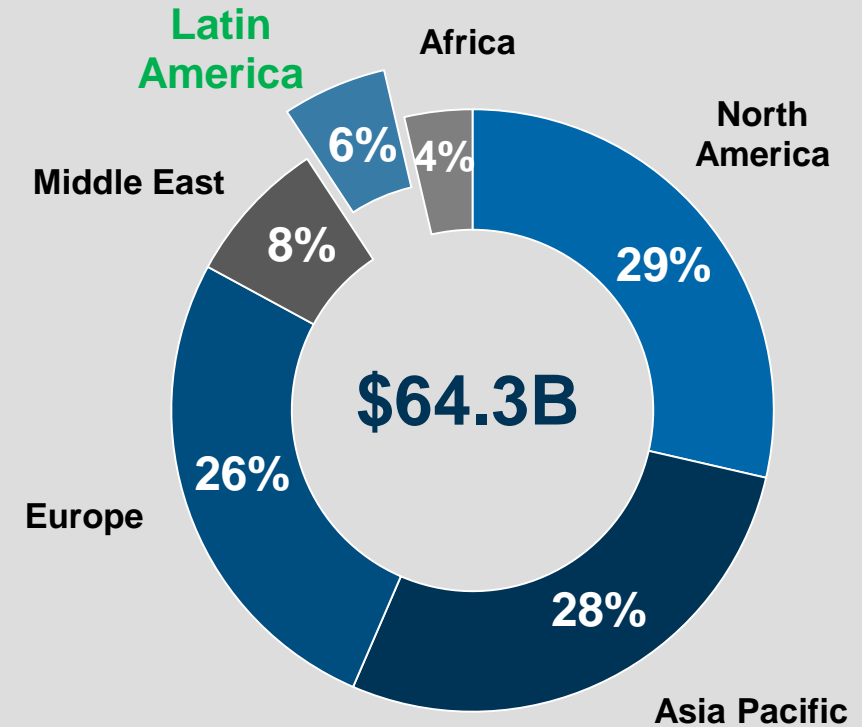


**Current commercial
air transport MRO
demand is \$64.3B;
with Asia equivalent
to North America
and Europe in
market size**

2015 Commercial Air Transport Global MRO Demand



By MRO Segment

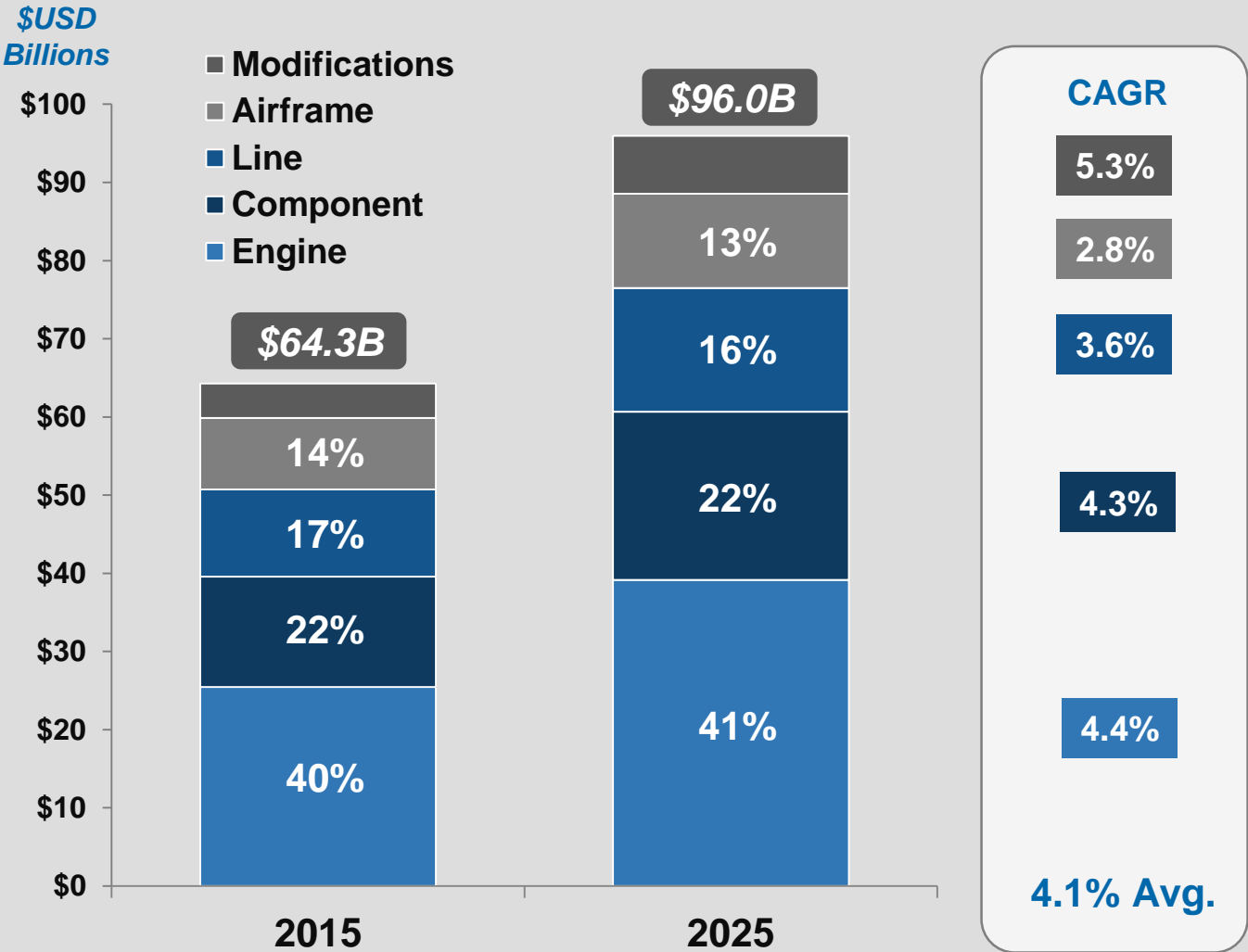


By Global Region

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

- Engine and component MRO markets remain the largest segments
- Modifications market will see the strongest growth (e.g. interiors, connectivity)
- Airframe market slows due to reduced man-hour intensity and increased check intervals as new fleets are introduced

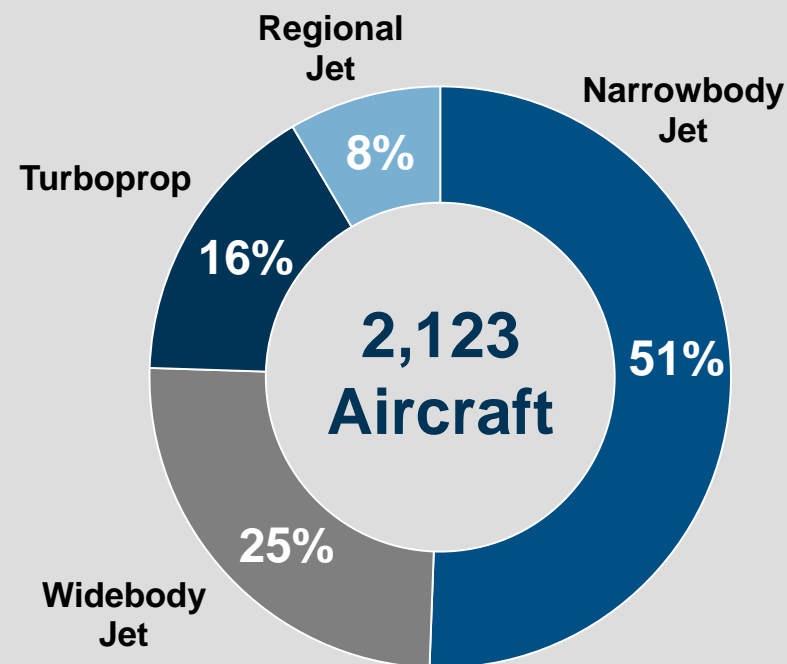
10 Year Global Commercial Air Transport MRO Demand Growth



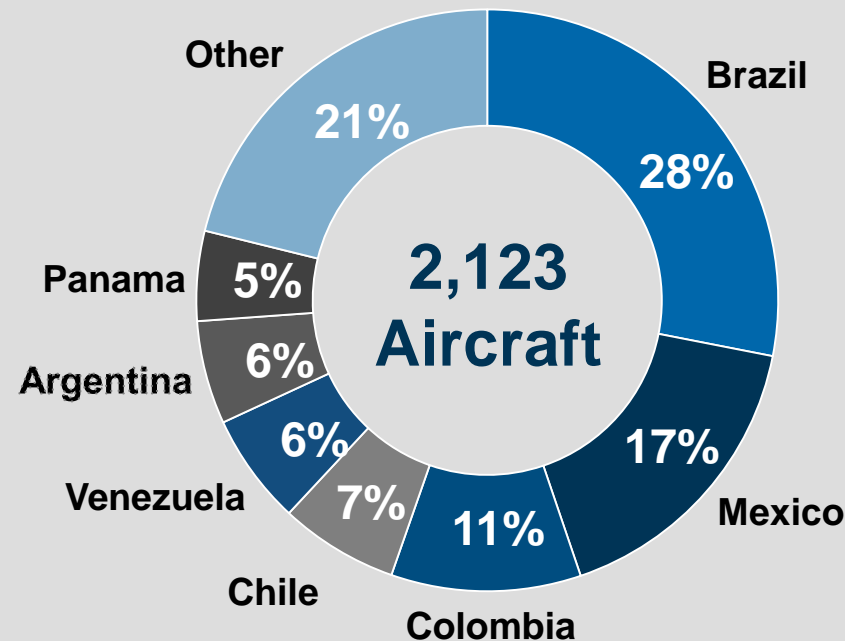
Source: ICF analysis; Forecast in 2015 \$USD, exclusive of inflation

The current Latin American fleet consists of over 2,100 aircraft; with more than 50% narrowbody

2015 Latin American Commercial Air Transport Fleet



By Aircraft Type

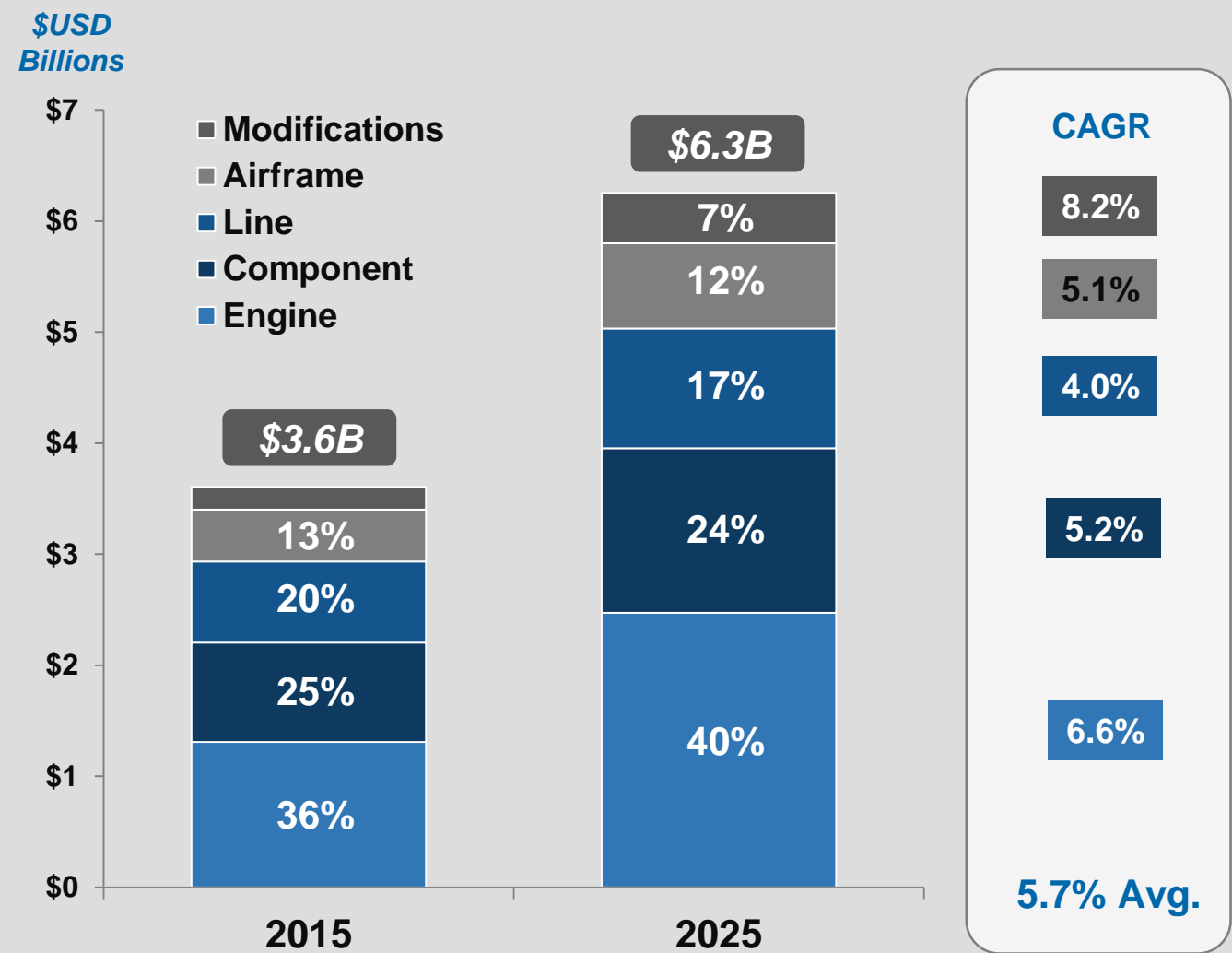


By Country

The Latin American MRO market is expected to grow to approx. \$6.3B by 2025, at 5.7% per annum

- Modifications is the fastest growing MRO segment in Latin America
- MRO spend on widebodies in Latin America will nearly double by 2025 as the fleet increases by 56%

10-Year Global Latin American MRO Demand Growth



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

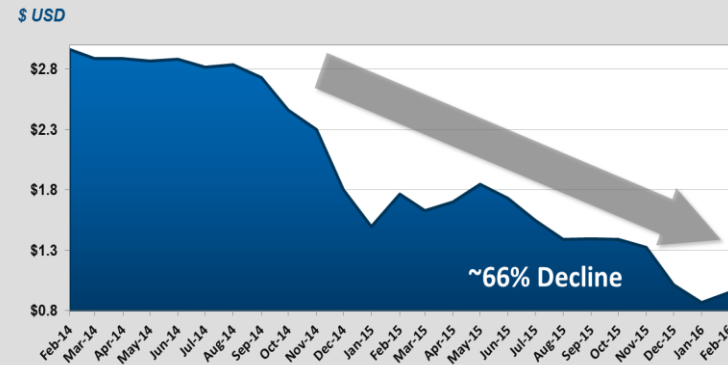
Latin American Aviation Outlook



Four external macro-economic forces are having a significant impact on Latin American operators and the broader MRO supply chain

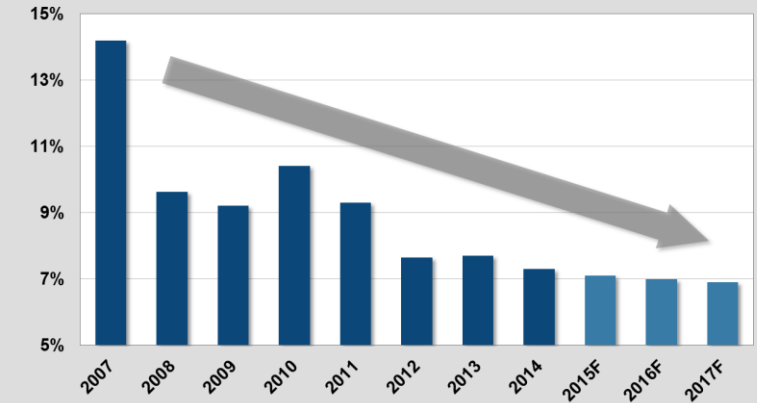
Fuel Costs

U.S. Gulf Coast Jet Fuel Price per Gallon



China's Economic Slowdown

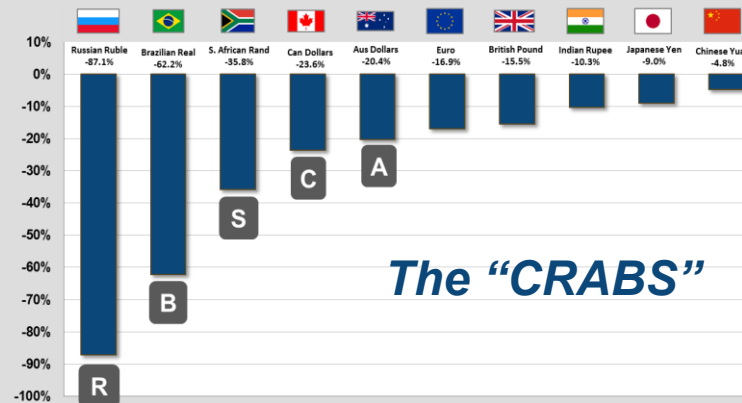
China GDP Year-on-Year Growth (%)



Source: IMF, World Economic Outlook Database October 2015, ICF International Analysis

Currency Exchange Rates

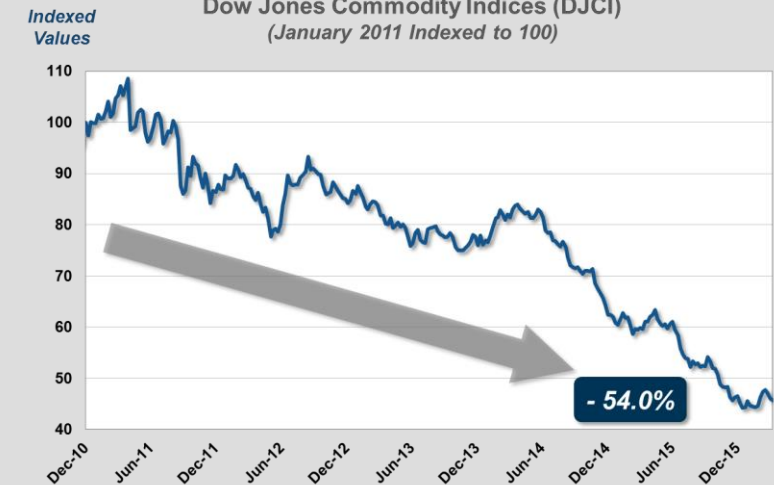
Global Currency Exchange Rates vs USD
% Value Change, April 2014 – April 2016



Source: Oanda historical exchange rates, ICF International Analysis

Global Commodity Prices

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



Source: Dow Jones Commodity Index

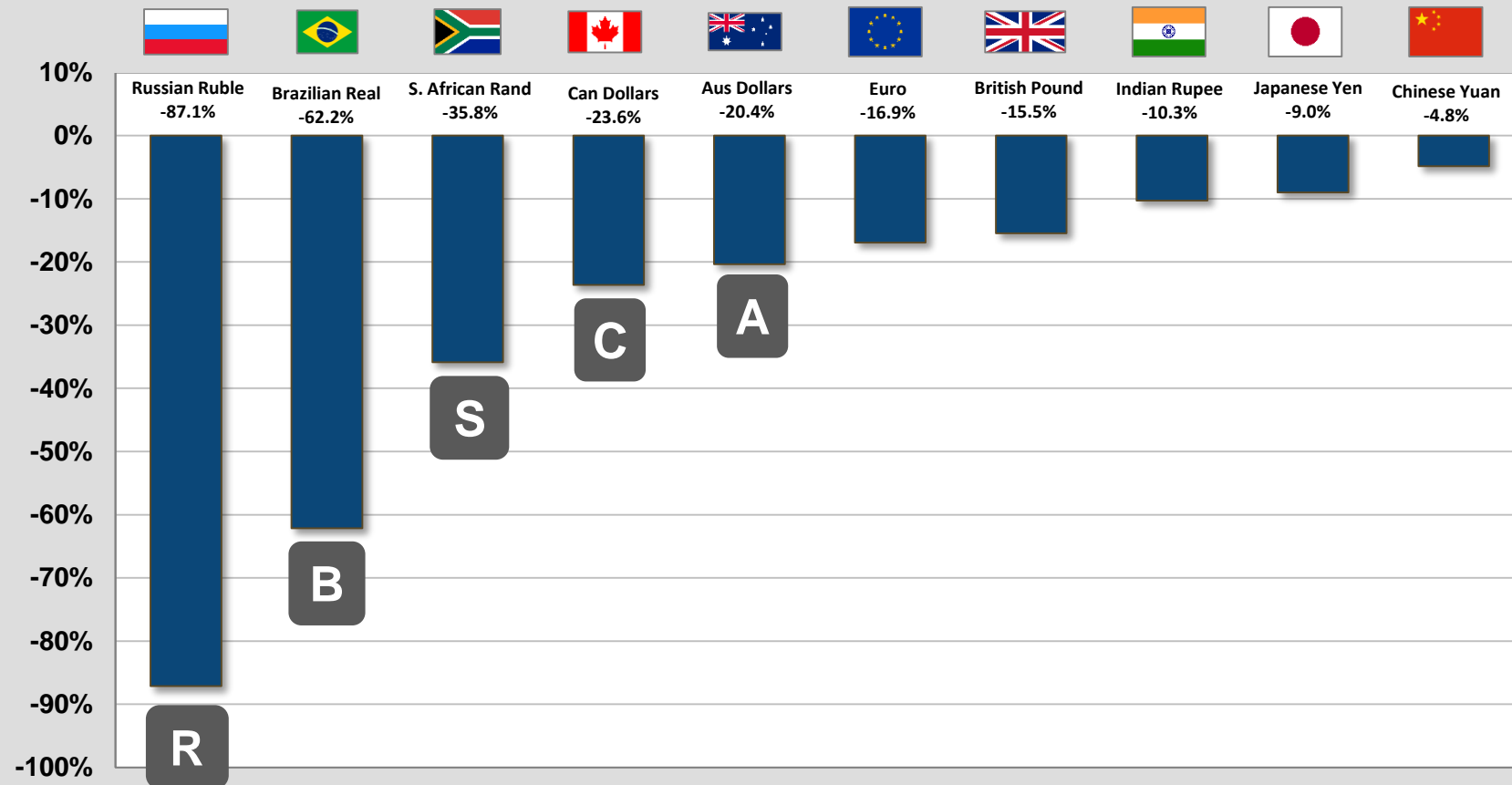
The dramatic increase in oil & gas market supply and reduced demand for commodities has led to a strong US Dollar

FOREX Impact

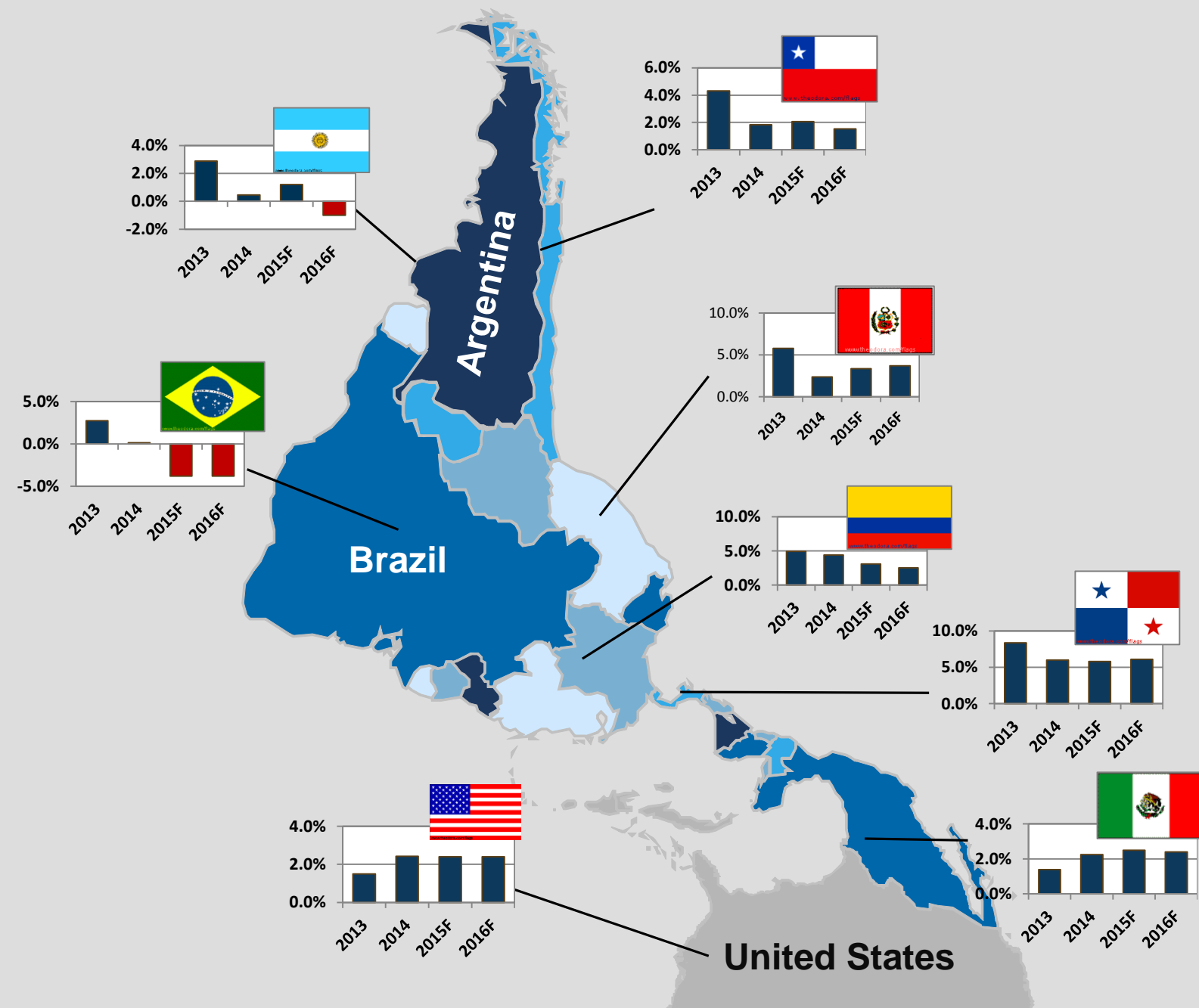
- Partially offsets the positive impact of low fuel costs for operators
- Increases the cost of dollar based flight hour agreements (and parts/material in general)
- Cost of labor for in-country MROs is cheaper driving up margins for US dollar based contracts
- Buying/leasing aircraft becomes more expensive

The “CRABS”: Countries with economies that are heavily dependent on commodity exports

Global Currency Exchange Rates vs USD
% Value Change, April 2014 – April 2016



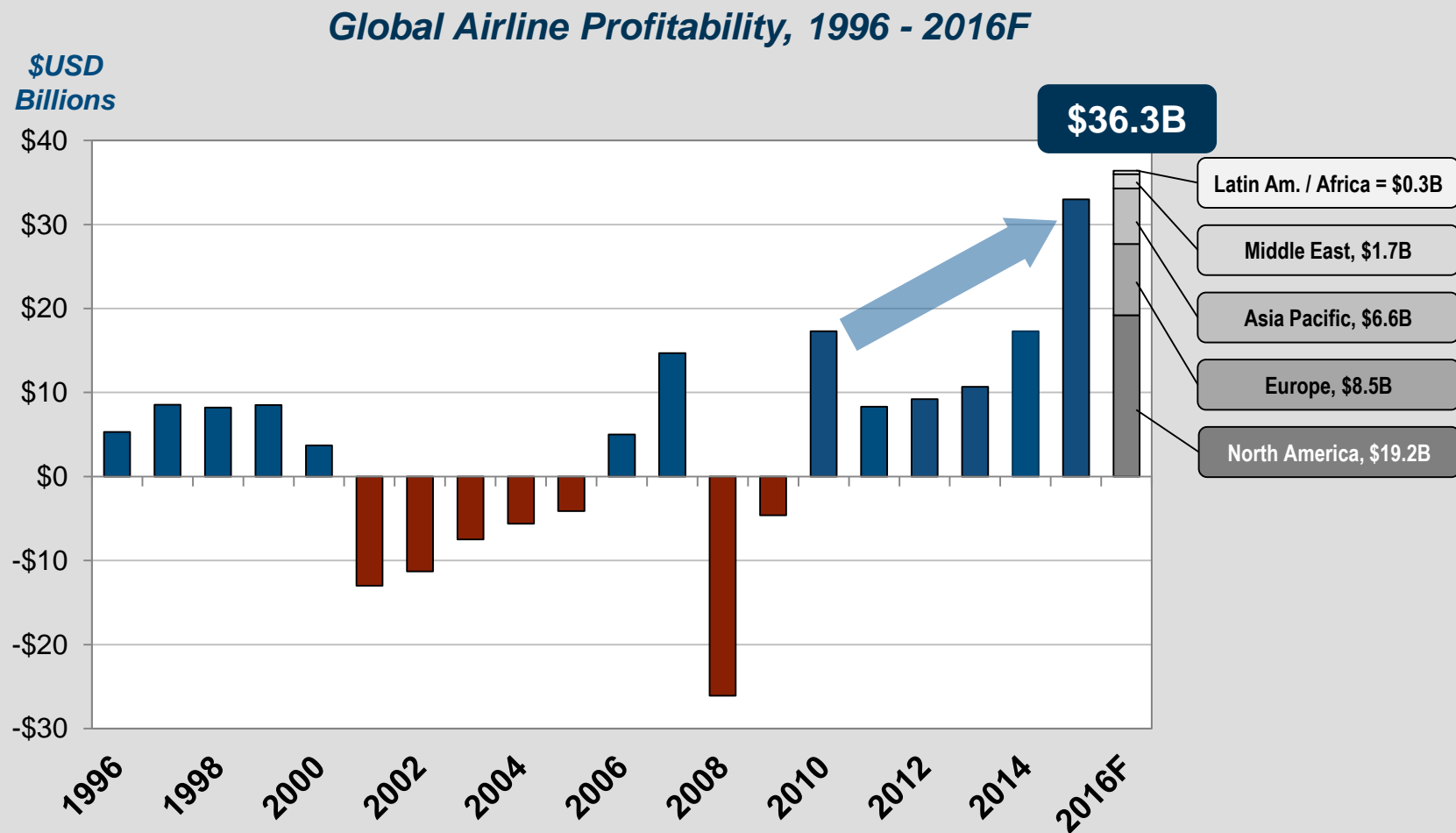
Despite ongoing challenges in Brazil, the majority of Latin American economies continue to show positive growth



Note: All GDP Growth are calculated based on constant price (nation currency)
Source: IMF Economic Outlook April 2016, ICF analysis

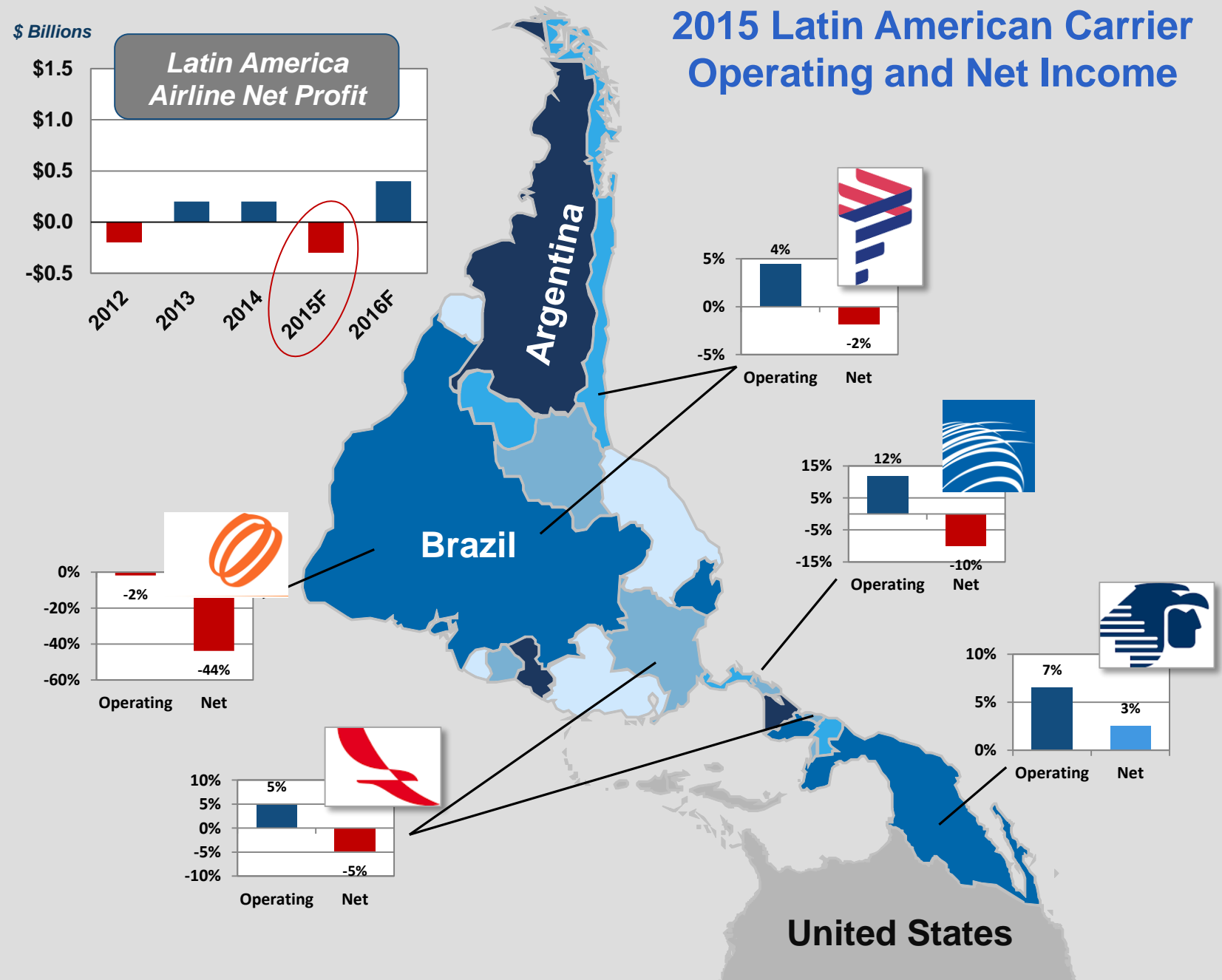
Driven by the significant drop in fuel costs and consolidation, the airline industry is achieving record profitability

These are the good ol' days; for some...



Despite significant headwinds, Latin American carriers have demonstrated impressive management skills

- Positive operating income demonstrates that airlines are doing a good job in managing what is in their control
- However, net income has clearly been negatively impacted by currency exchange rates (out of their control)



Trend Watch:

The Mod Squad

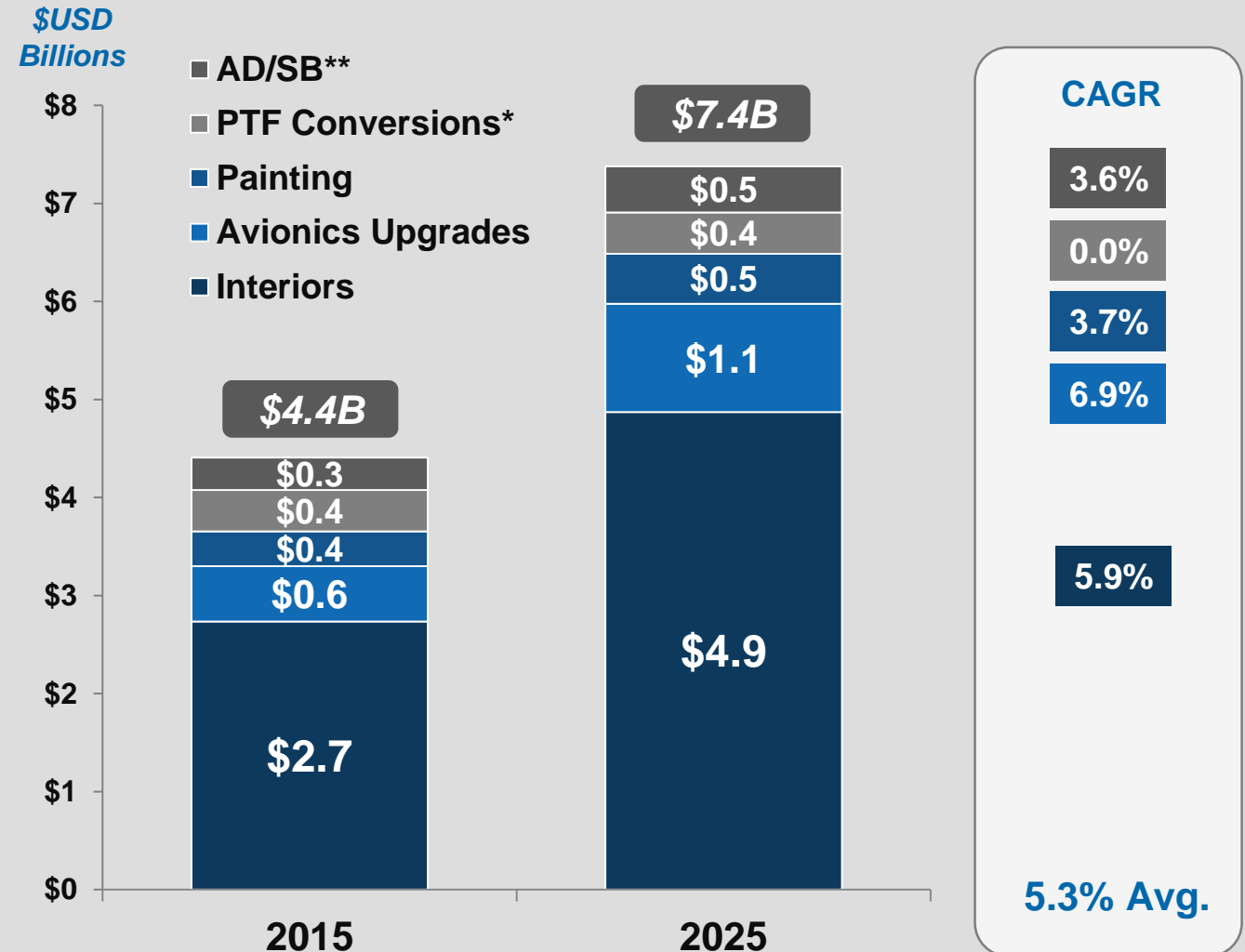


Modifications growth is driven by airlines seeking differentiation in the cabin and customer experience

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

Commercial Air Transport Modifications Forecast



Modifications demand includes labor and material spend

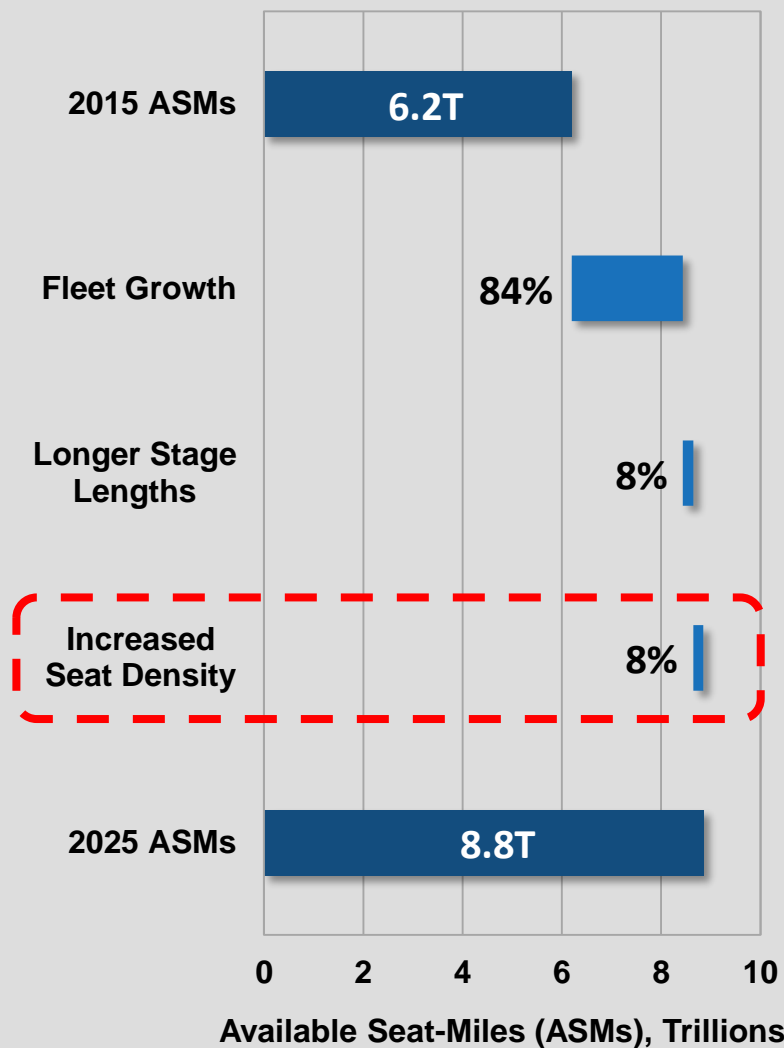
*Passenger-To-Freighter Conversions

**Airworthiness Directives / Service Bulletins

Source: ICF analysis, constant 2015 US\$

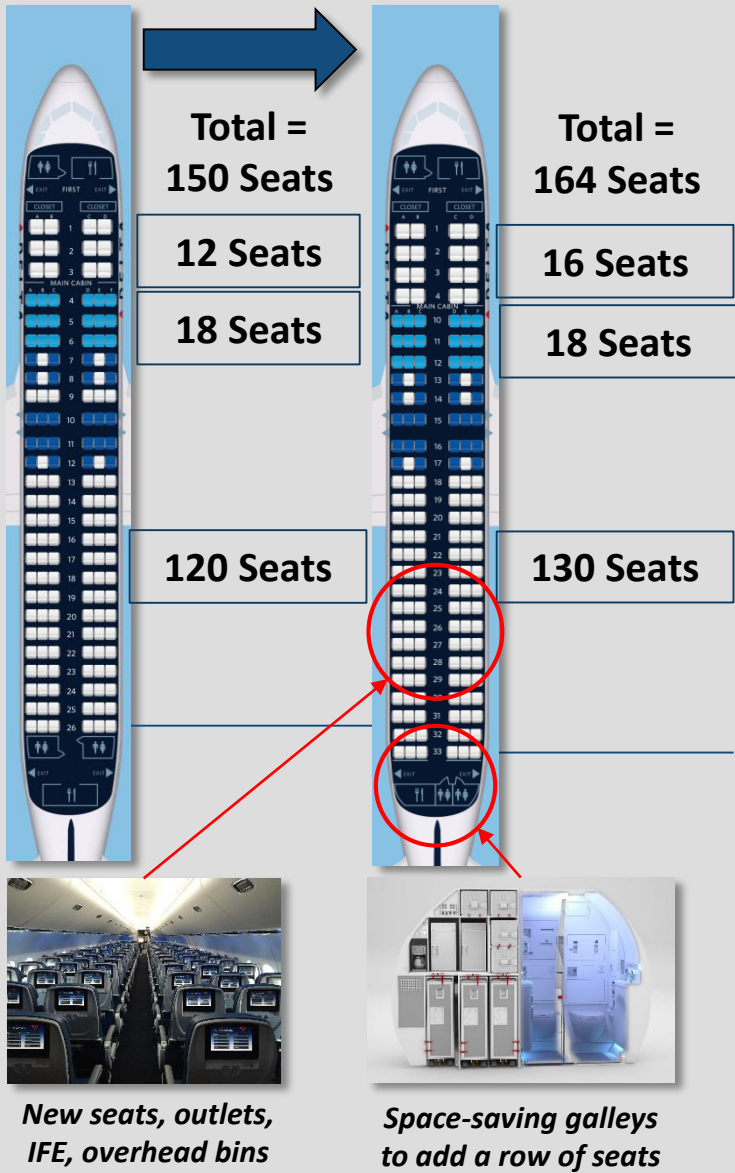
Cabin “*densification*” has emerged as cost effective strategy for airlines to increase capacity and drive bottom line growth

2015 - 2025 Capacity Bridge



Source: ICF analysis, delta.com

Example: Delta A320 Interior Modification Program

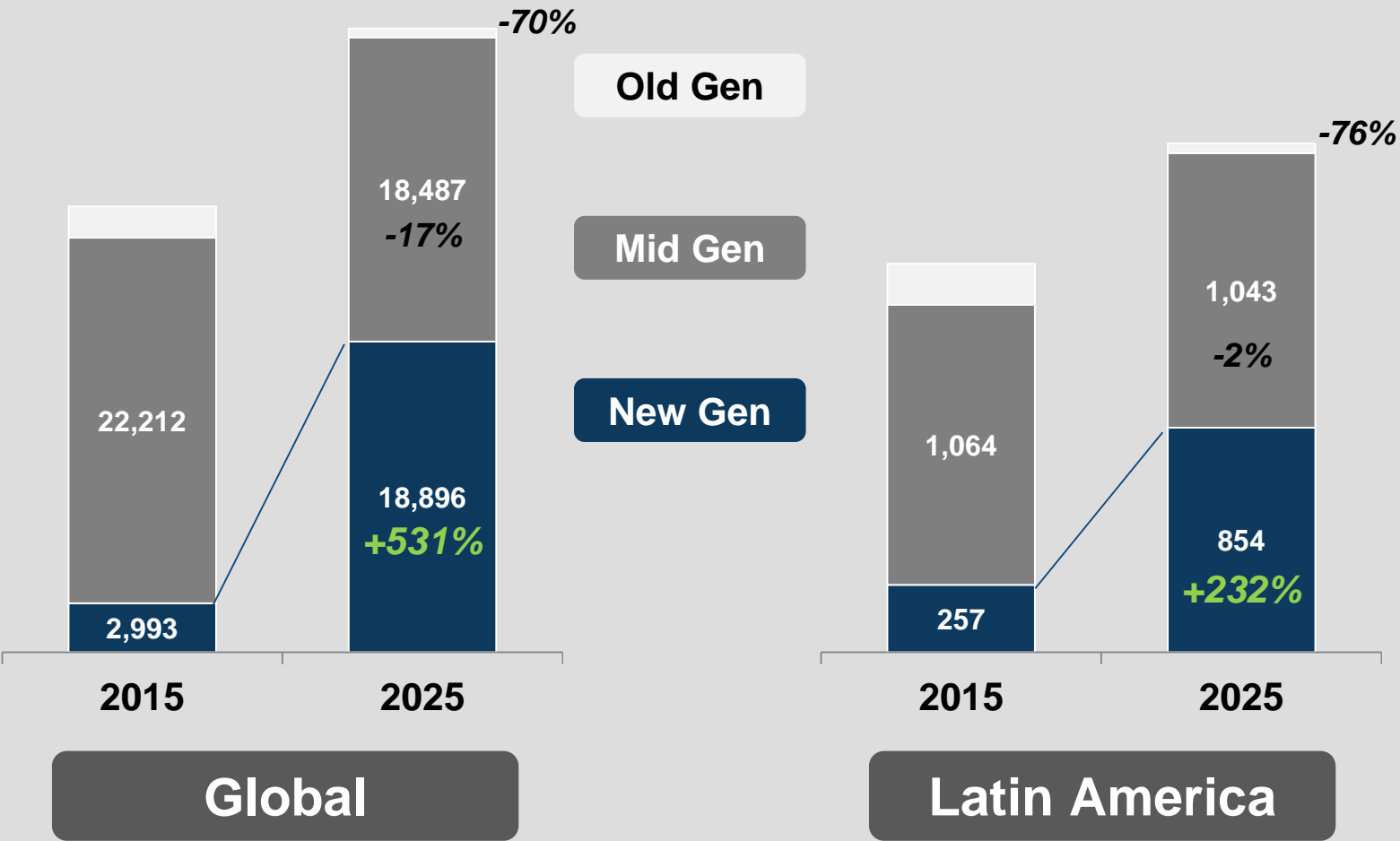




Trend Watch: *New Technology Aircraft*

Over the next decade, the global fleet of new generation aircraft fleet will grow by approx. 531% to nearly 19,000 aircraft

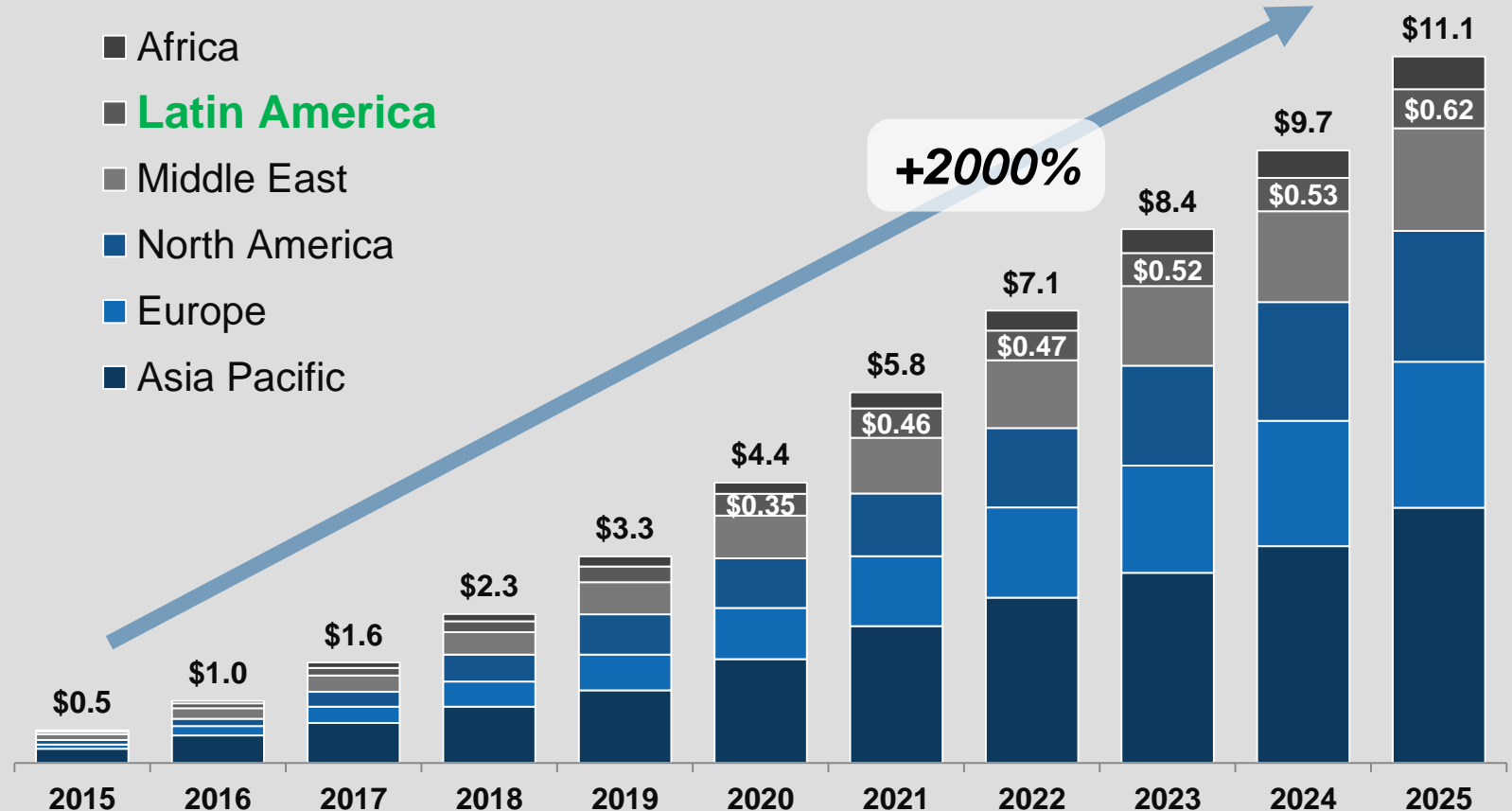
10-Year Fleet Forecast by Aircraft Generation



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
Source: ICF analysis

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

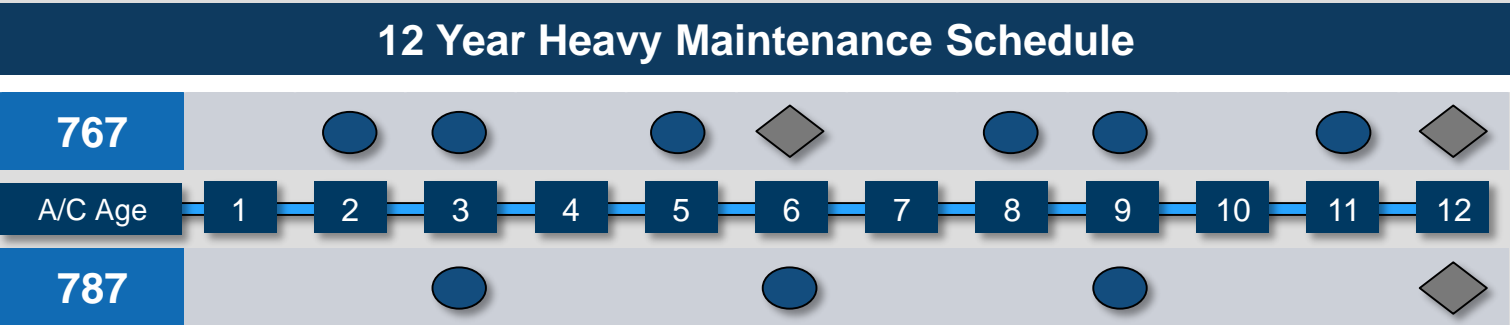
10-Year MRO Spend for New Technology A350 and 787 Aircraft \$ USD Billions



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

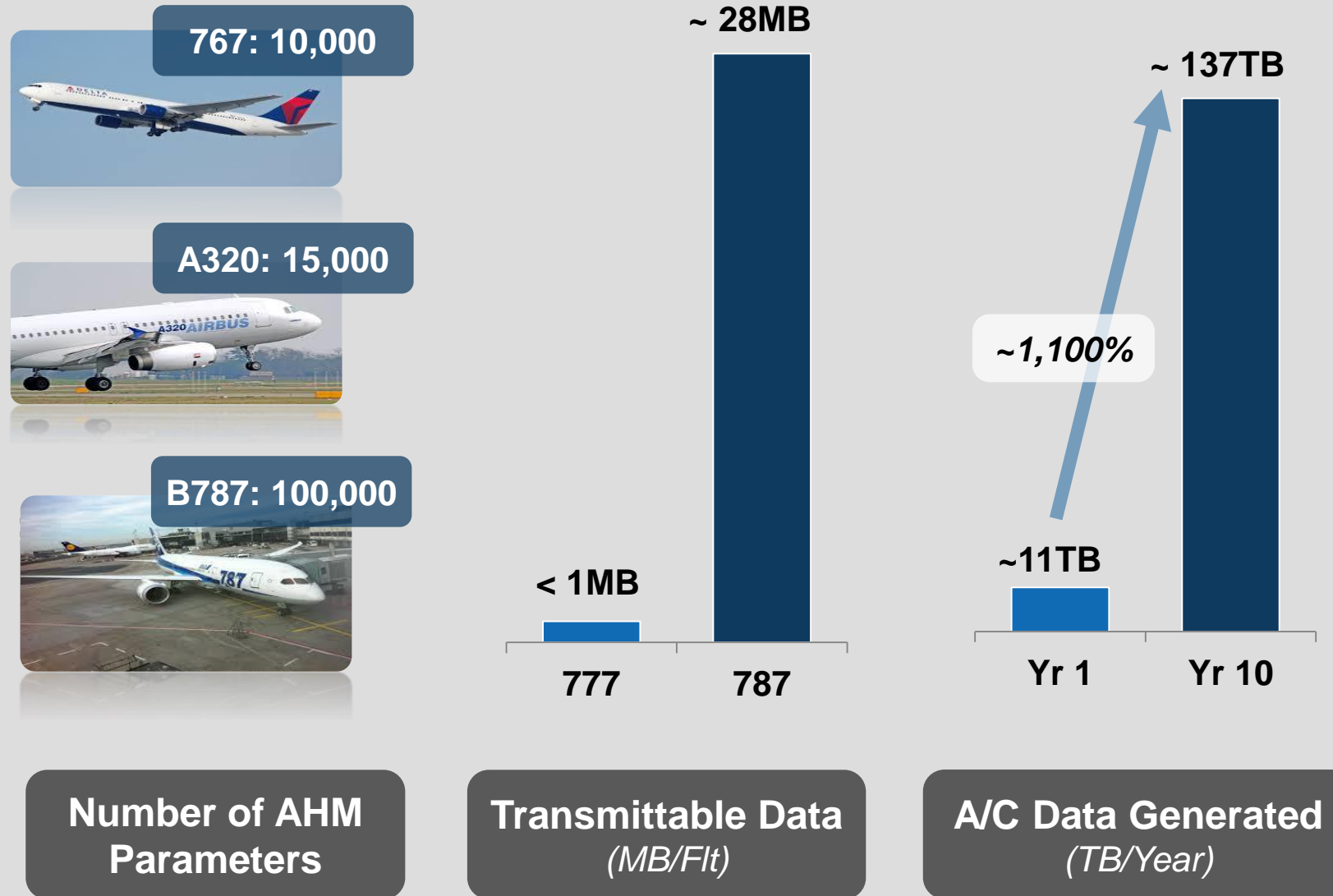
*Based on 4,000 FH/yr utilization
767 C-check = 18mo, 4C = 72mo; 787 C-check = 36mo, 4C = 144mo
Assumed industry standard labor man-hour rate
Aircraft out of Service (AooS) calculated for C/4C/8C checks assuming industry standard MRO hangar productivity
Source: ICF analysis

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

■ **Stakeholder Battle:**
Who will control and benefit most from the operating data IP?

- Operators
- Lessors
- OEMs
- MRO Suppliers

Aircraft Health Monitoring and Data Generation Outlook



Trend Watch: *MRO Investment in Latin America*



The Latin American
MRO Supplier
Landscape largely
consists of airframe
MRO suppliers, with
limited component
capabilities





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THANK YOU!

For questions regarding this presentation, please contact:

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Acronyms

- **A/C** = aircraft
- **AD/SB** = airworthiness directives/service bulletins
- **AHM** = aircraft health management
- **ASM** = available seat-mile
- **CAGR** = compound annual growth rate
- **CRABS** = Canada, Russia, Australia, Brazil, and South Africa
- **Gen** = generation
- **IFE** = in flight entertainment
- **IP** = intellectual property
- **M&A** = mergers and acquisitions
- **Mod** = modification
- **MRO** = maintenance, repair, and overhaul
- **OEM** = original equipment manufacturer
- **USD** = United States dollar