


GLOBAL MRO MARKET

Forecast & Trends

Presented by:

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Aircraft Maintenance Russia and CIS 2013
February 20—21, 2013
Moscow, World Trade Center

ICF SH&E is one of the world's largest and most experienced aviation consultancies





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- **80+ professional staff**
  - **Dedicated exclusively to aerospace and aviation**
  - **Recruited from the industry**
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- **Specialized, focused expertise and proprietary knowledge**
- **Broad functional capabilities**
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- **Global presence with six major offices**

SH&E

joined ICF in 2007

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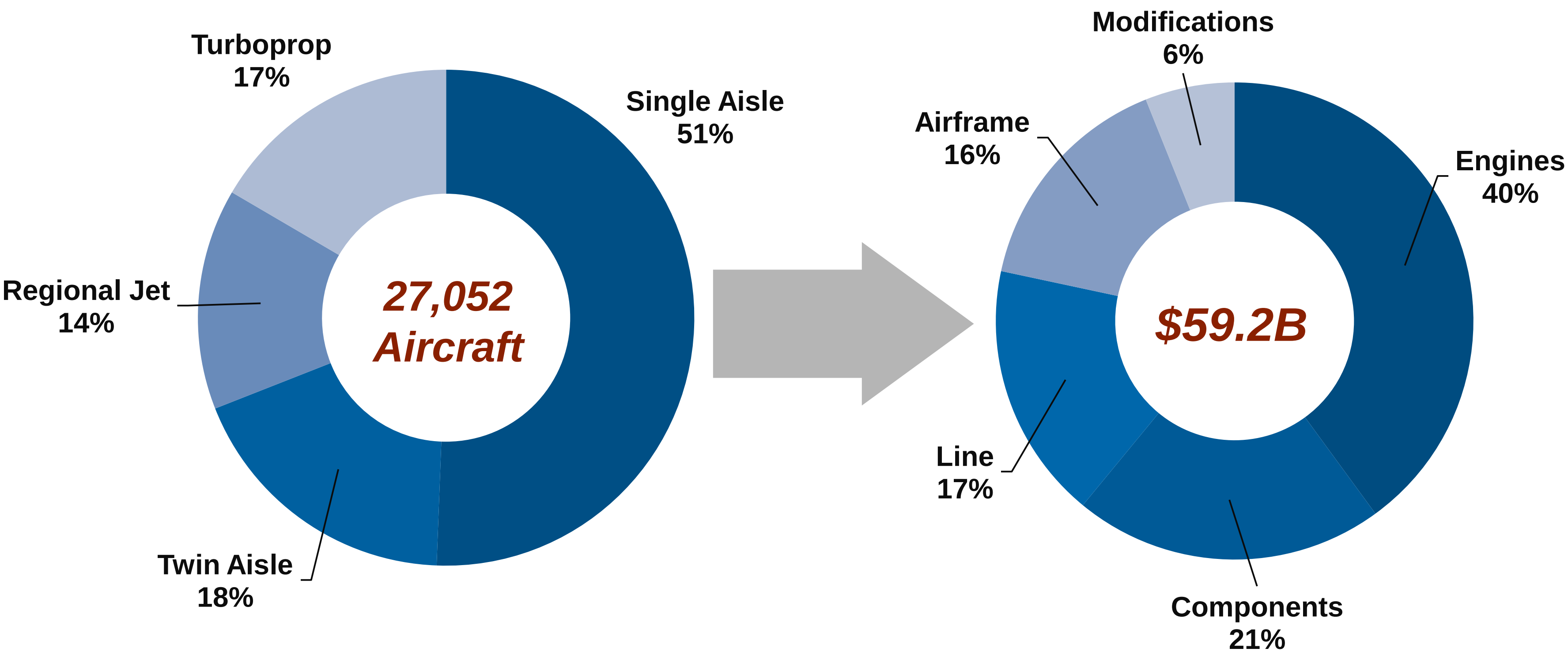
Today's Agenda

- **MRO Market Forecast**
- **Global MRO Trends**
  - Outsourcing
  - Changing Role of the OEM
  - Next Generation MRO IT
  - Regional Jet OEM Dynamics
  - Impact of Airline Mergers

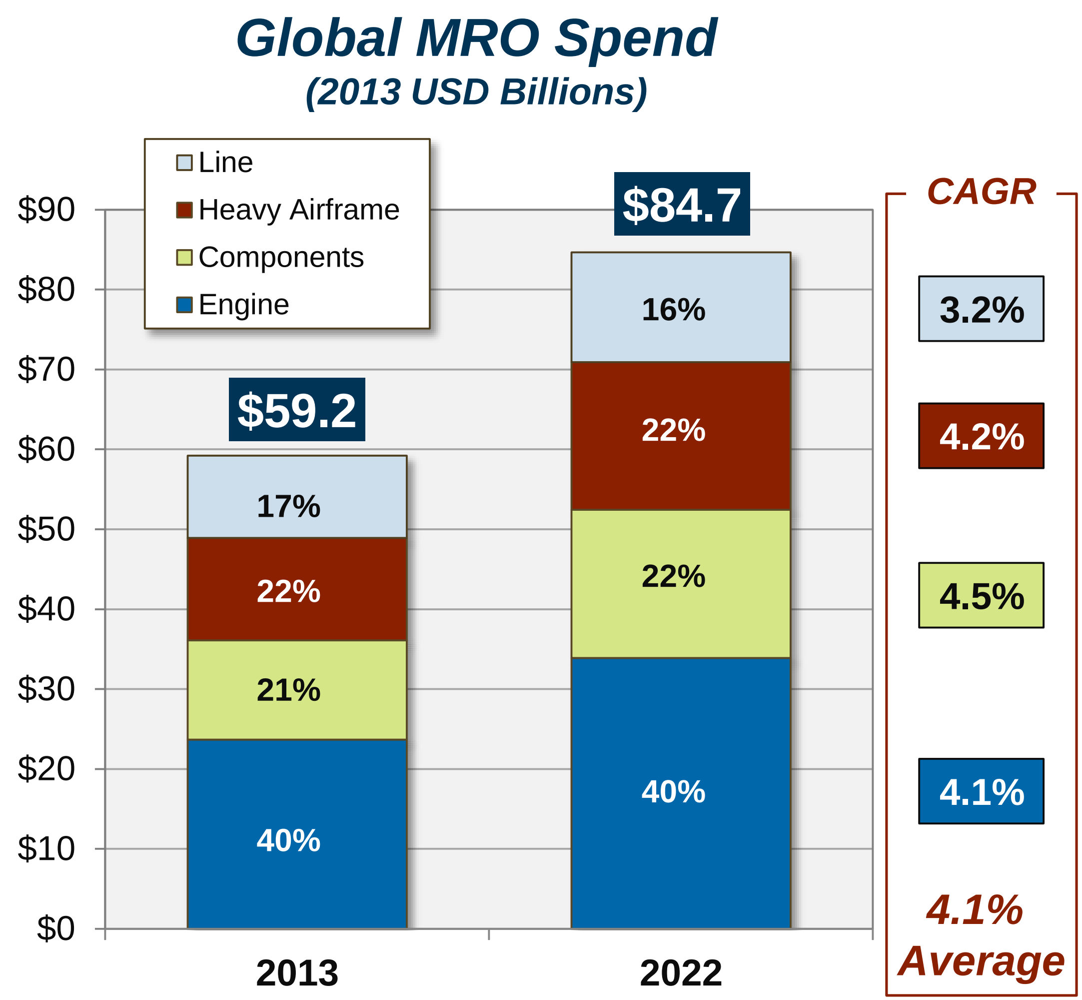
Today's active air transport fleet consists of 27,052 aircraft, generating a global MRO spend of $59.2B

*2013 Global Air Transport Fleet and MRO Market**



* Includes Turboprops
Forecast in 2013 $USD, exclusive of inflation
Source: ICF SH&E analysis

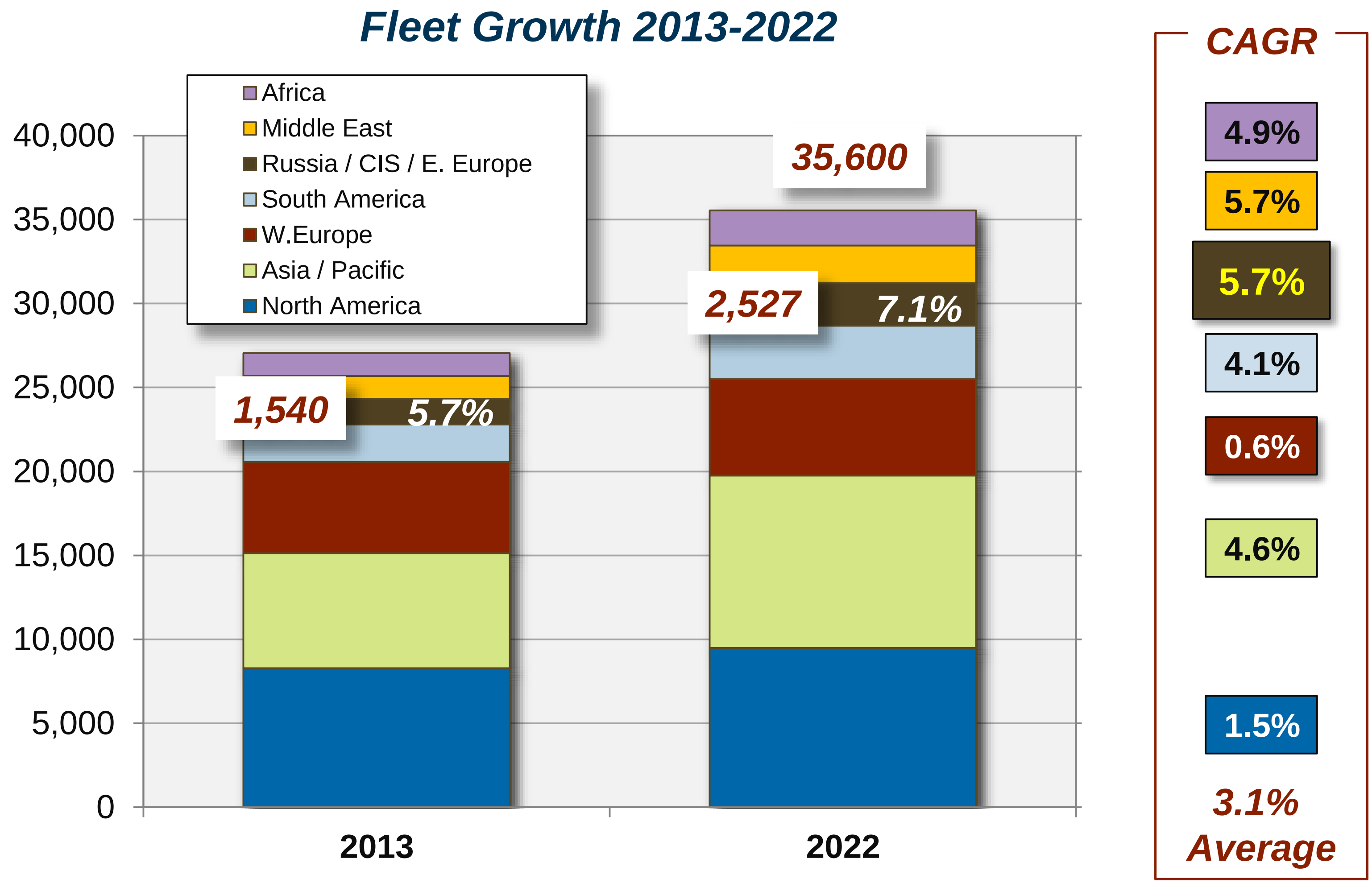
The global MRO market, currently $59.2B, is expected to grow to $85B by 2022, at 4.1% per annum



- **Average growth is forecast to be 4.1% CAGR to $85B in 2022**
- **Growth outlook reflects the blended impact of:**
  - **Fleet and utilisation growth**
  - **Typically higher cost/event**
  - **Improvements in reliability**
  - **Fleet age demographics**
- **Despite reducing manhour intensity of airframe heavy checks as the fleet renews, upgrade and modification demand means airframe heavy MRO grows at 4.2% CAGR**

Source: ICF SH&E analysis
Forecast in 2013 $USD, exclusive of inflation. Includes turboprops

The Russian/CIS/E. European fleet will grow faster than other global regions at 5.7% CAGR



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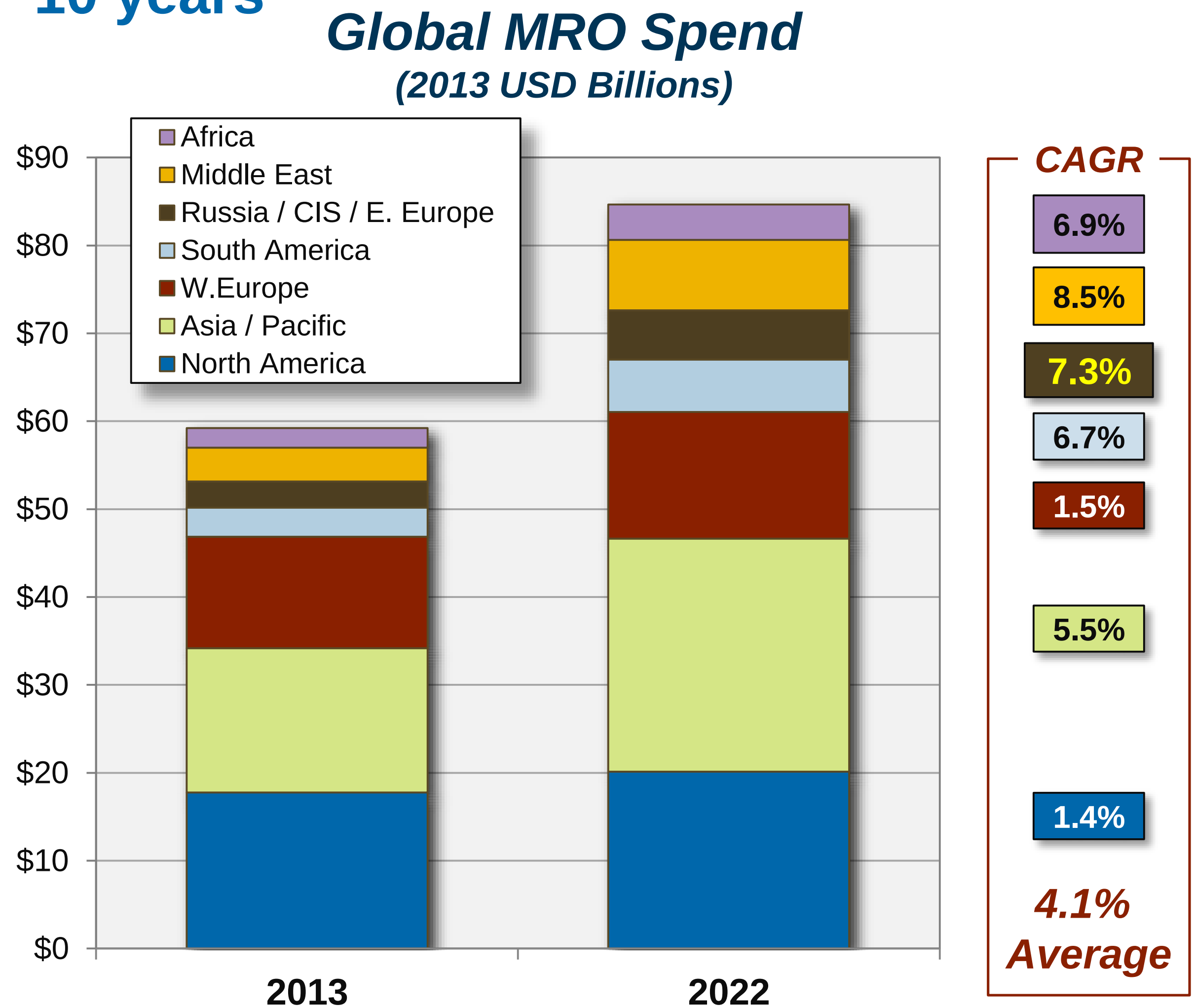
Forecast in 2013 $USD, exclusive of inflation
Source: ICF SH&E analysis

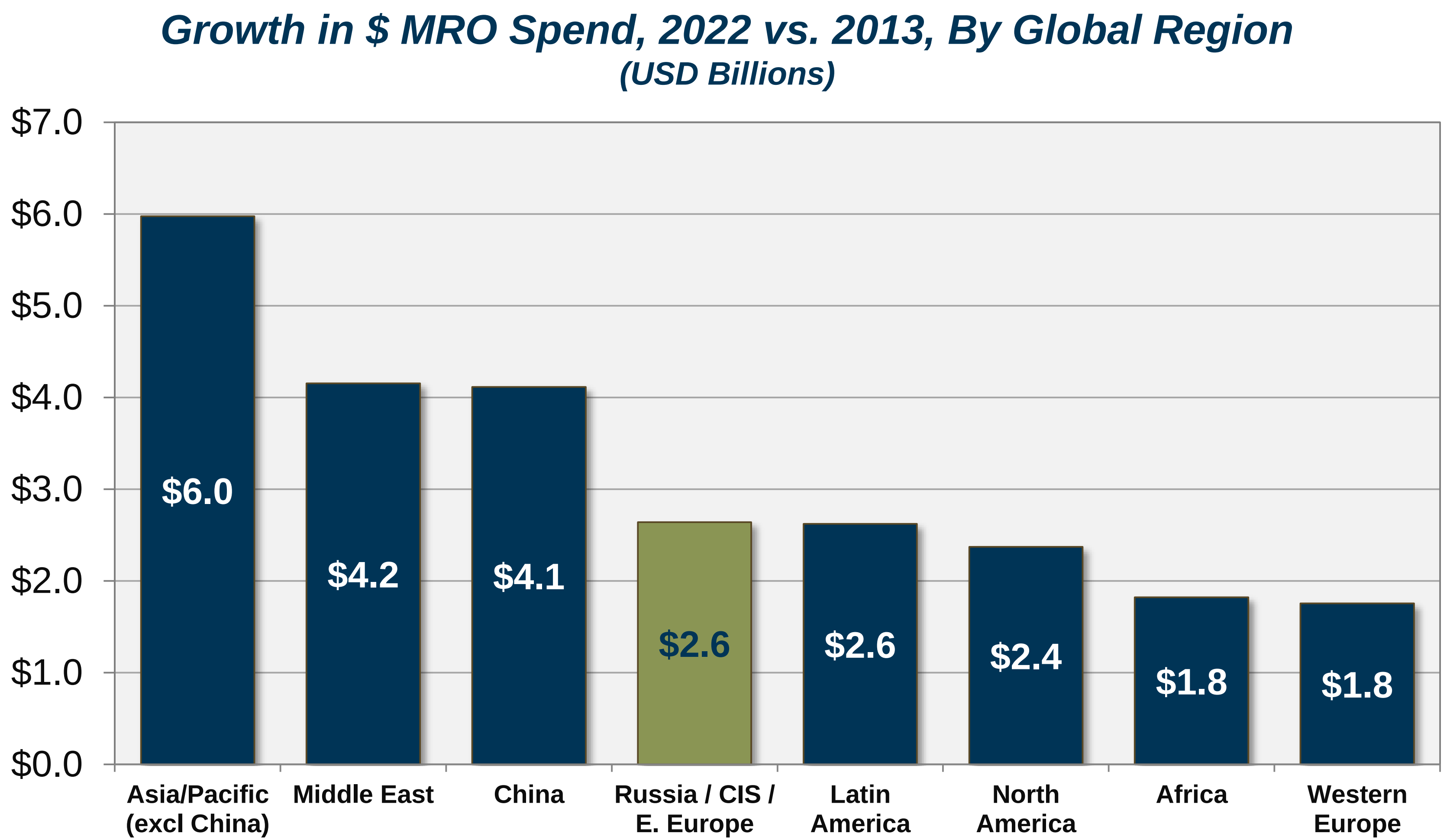
The MRO demand generated by the Russian/CIS/E. European fleet is forecast to grow at 7.3% CAG, from $3B today to $5.6B in 10 years



- **There is strong MRO growth from in the Russian, CIS and E. European region (led by Russian operators)**
- **The mature North America MRO market remains virtually flat – *1.4% growth per year***
- **The Middle East has the fastest projected growth (led by Emirates, Qatar Airways, Etihad and Air Arabia)**

Source: ICF SH&E analysis
Forecast in 2013 $USD, exclusive of inflation. Includes turboprops

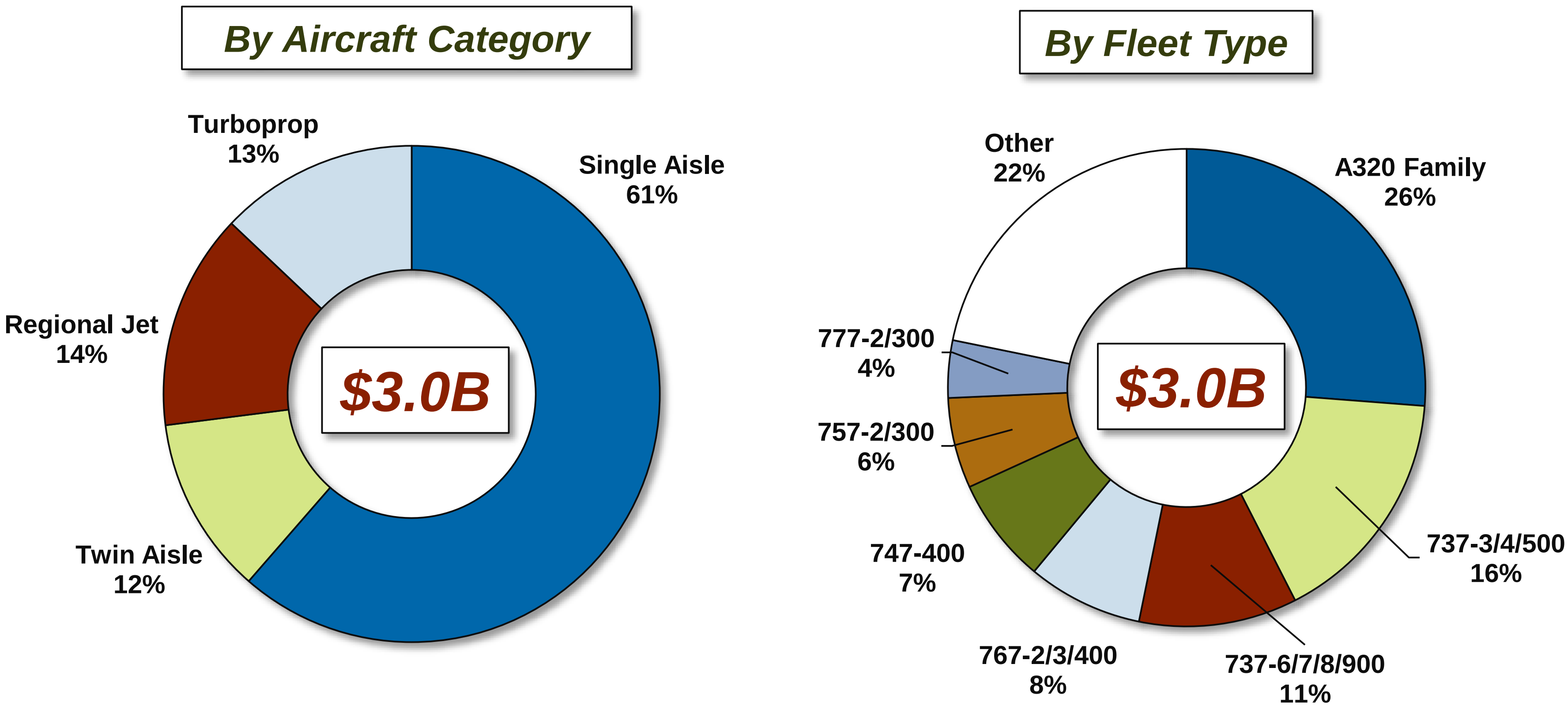
Russian/CIS/E. European 10 year MRO growth in absolute $USD terms will be greater than North America and Western Europe



Source: ICF SH&E analysis
Forecast in 2013 $USD, exclusive of inflation. Includes turboprops

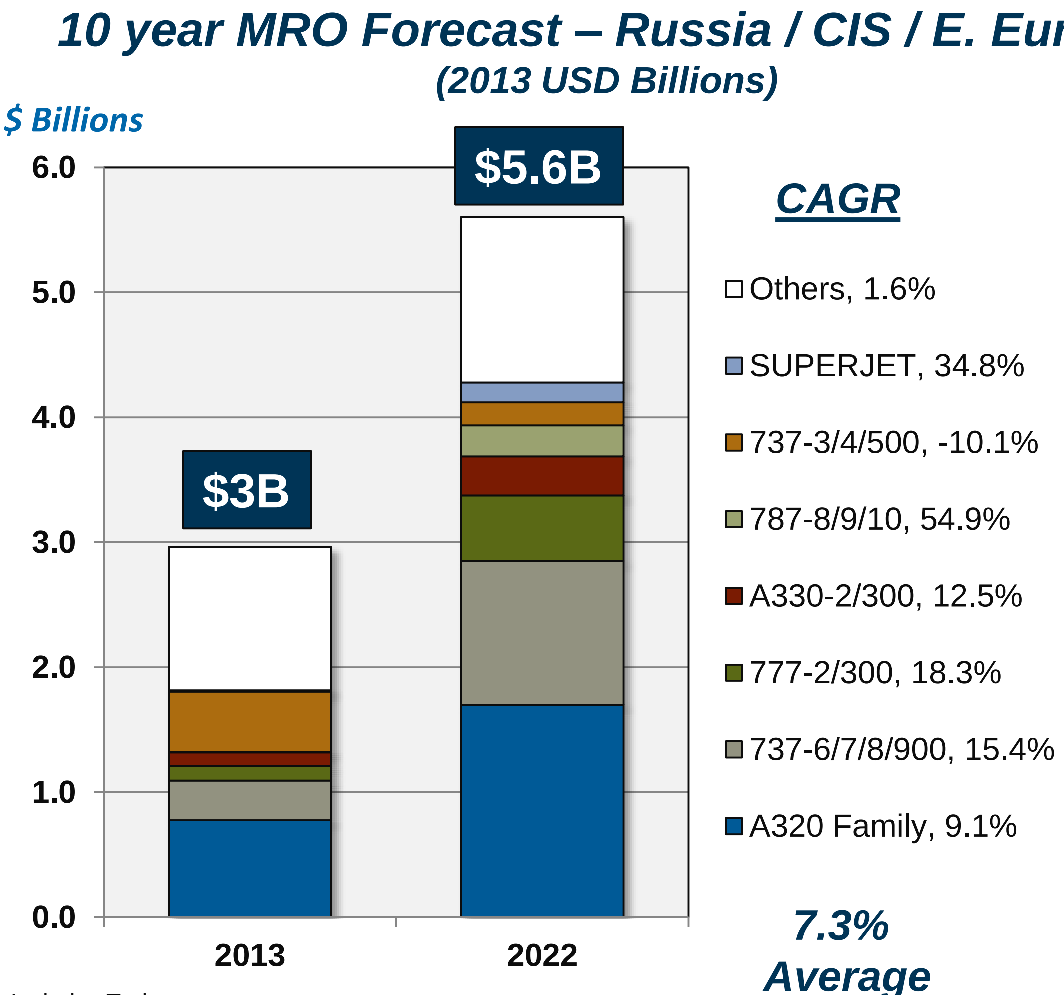
Russian/CIS/E. European fleet generates an MRO spend of $3.0B; over 60% is narrowbody aircraft

*2012 Russian / CIS / Eastern Europe MRO Market**



* Includes Turboprops
Source: ICF SH&E analysis
Forecast in 2013 $USD, exclusive of inflation

The Russian/CIS/E. European MRO demand is forecast to grow at 7.3% per annum, led by A320 and Boeing 737NG family



- **Narrowbodies remain dominant led by 737NG and A320 family**
- **737 Classic, with the second biggest MRO spend in 2013, declines at 10% per annum over the decade**
- **Significant growth in widebody fleets and cargo, especially the 777 and A330 family**
- **787 and Superjet are projected to grow significantly in fleet size and MRO spend over decade**

* Includes Turboprops
Source: ICF SH&E analysis
Forecast in 2013 $USD, exclusive of inflation

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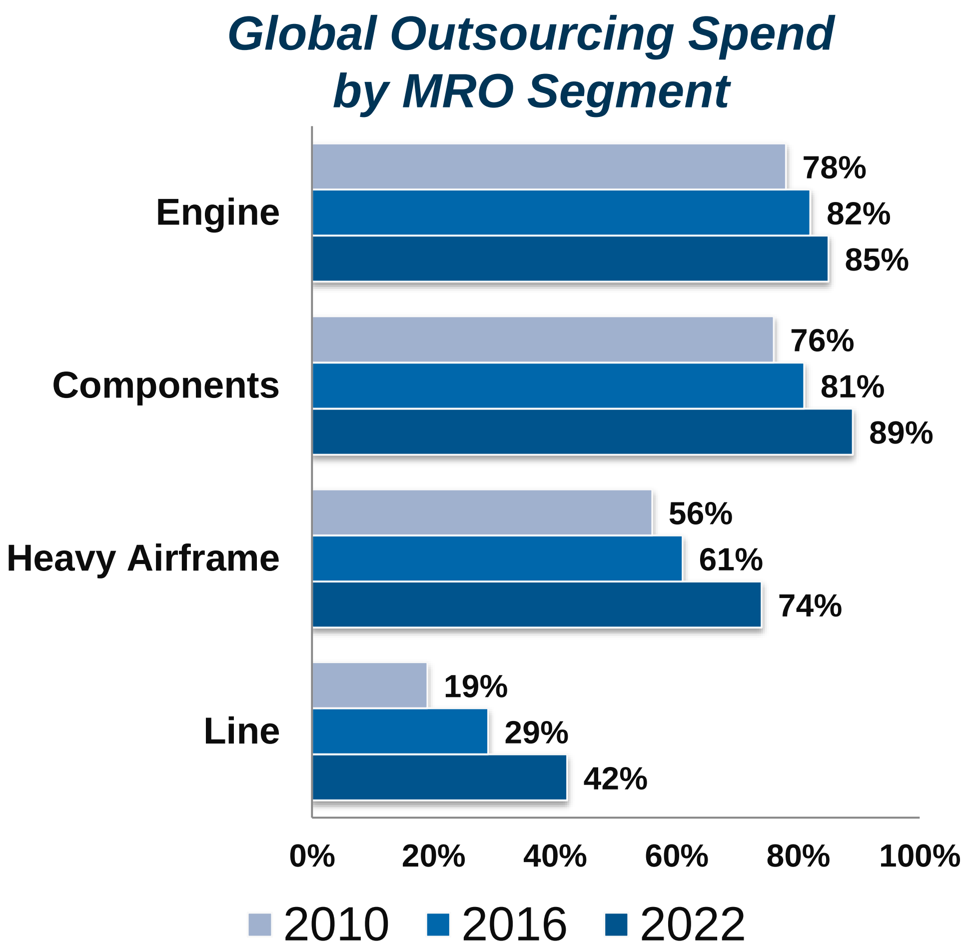
Capital and material intensive MRO segments will continue to be outsourced...



- **Airline industry economics will continue to drive growth in outsourcing**
- **Currently the world airlines outsource nearly 65% of all MRO activity**
- **Labor intensive airframe work will continue to “Right-Shore”; migrate to lower labor cost countries near the home region**
- **Line Maintenance is expected to be the fastest growing segment of outsourcing (starting from the lowest base)**

Source: ICF SH&E Analysis

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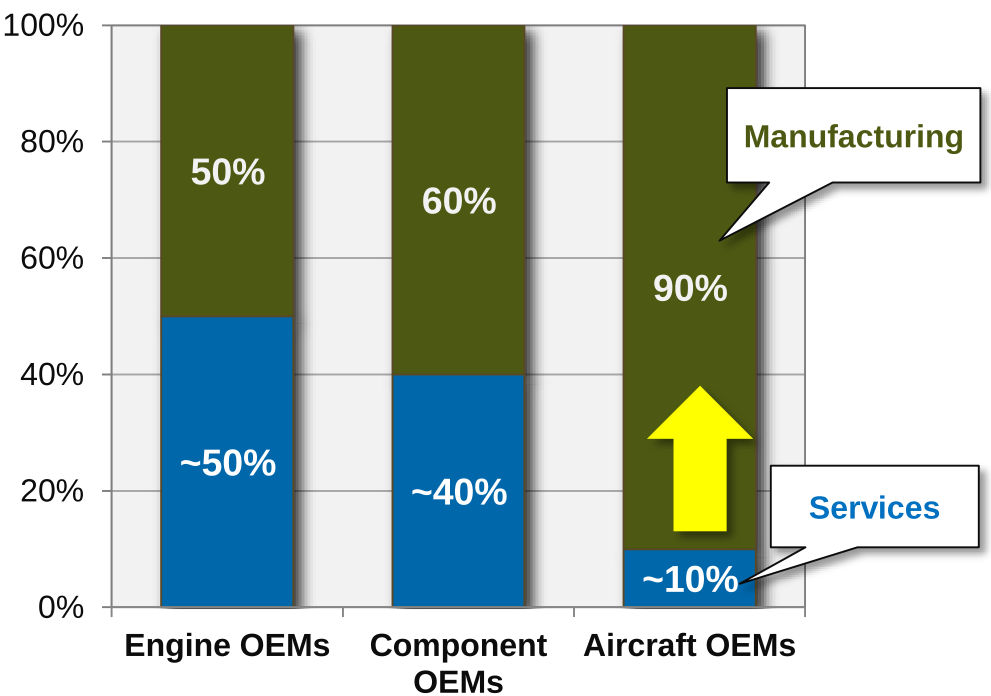
Aircraft OEMs are fast becoming major MRO players…

Typical OEM Revenue Mix



- **The EADS Vision 2020 goal is 25% services revenue by 2020**
- **Two major acquisitions in 2011: Satair and Vector Aerospace**
- **Numerous FHS contracts**

- **Launched EDGE in 2012 to create coordinated services brand**
- **Major player in flight training, distribution, and consumables management**
- **Two new GoldCare contracts**

Sources: ICF SH&E Analysis, EADS Vision 2020

Tier 1 supply chain model continues to evolve as OEMs consolidate their aircraft manufacturing programs…

Component MRO Spending Distribution B777 versus B787

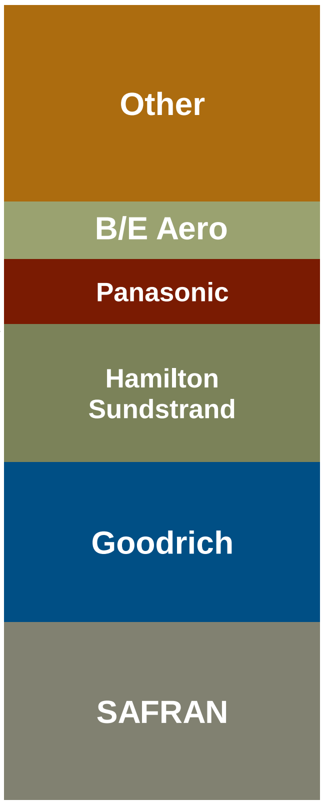
B777

- B/E Aero
- C&D
- Hamilton
- Hispana Suiza
- Parker
- Jamco
- Liton
- Woodward Gov
- Contour
- Recaro,
- Driessen
- Sell, 1%
- Boeing Wichita
- Avox
- Carleton
- NordMicro
- BAE
- Peco
- Techspace
- Cox
- Crane
- CMC
- Meggitt
- Pacific Scientific
- Eaton
- Hughes Trietler

Supplier Consolidation

Tier I supply chain model; redefined system architectures

B787



Source: ICF SH&E Analysis, Airframer, Teal Group

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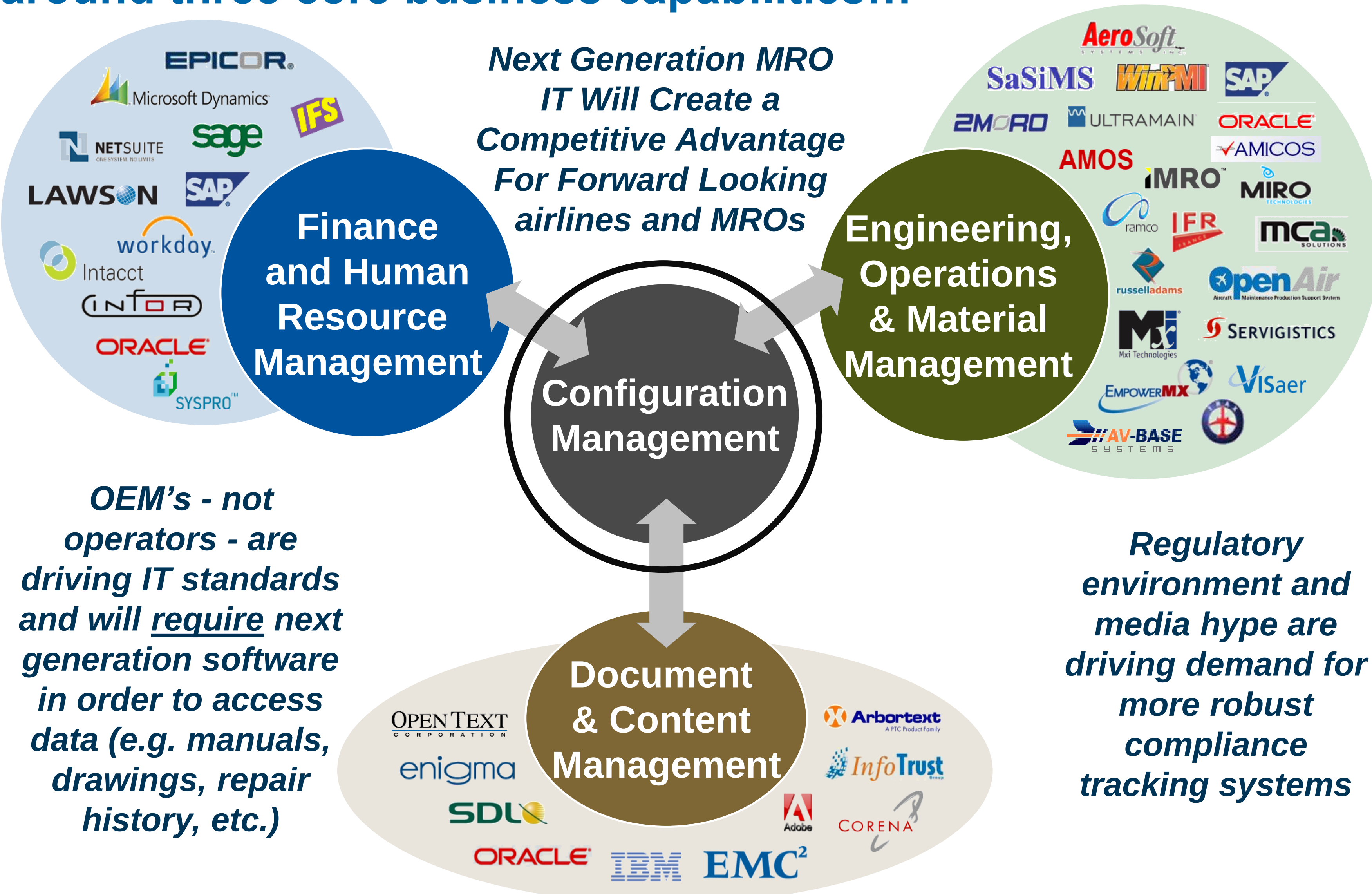
Next generation MRO IT software products are coalescing around three core business capabilities…

Next Generation MRO IT Will Create a Competitive Advantage For Forward Looking airlines and MROs



OEM's - not operators - are driving IT standards and will <u>require</u> next generation software in order to access data (e.g. manuals, drawings, repair history, etc.)

Regulatory environment and media hype are driving demand for more robust compliance tracking systems

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After decades of a virtual OEM duopoly in the regional jet market, the RJ market is now very competitive

SuperJet 100

Order Book:
- Net Orders: 180
- Options: 72

- Mexico's Interjet took delivery of first aircraft in Oct 2012 making it the first western customer to receive the aircraft

ARJ21

Order Book:
- Net Orders: 232
- Options: 70

Who will be the winners and losers in the 70-110 aircraft market battleground?

C-Series

- Order Book:
  Net Orders: 173
  Options: 114

'G2' E-Jet Family

- Capacity:
  78-122 seat range with common wing
- EIS: 2018

MRJ 70/90

Order Book:
- Net Orders: 165
- Options: 160

- US' SkyWest with game- changing order for 100 aircraft and 100 options

Sales Figures: ACAS, December 2012

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Although most mergers offer some scale benefits, ICF SH&E research has shown that cost reduction targets are often difficult to achieve

Bottom-Line Impact After Airline Mergers

Airline Cost Centers	Revenue	Cost Impact
Pilots & Flight Attendants		↑
Ground Operations		↔
Fuel		↔
Maintenance & Engineering		↑
Fleet Ownership & Insurance		↔
Navigation & Landing fees		↔
Sales, Marketing and Distribution		↔
General & Administrative		↔
Network Planning & Revenue Mgt.	↑↑	
Technology		↑↑
Overall:	↑	↔

Key Insights

- **Primary benefits are network rationalization and pricing power**
- **Labor rates tend to rise to higher of the two carriers' wage scale for each category**
- **Technology integration costs are ALWAYS underestimated**
- **Maintenance & Engineering generally achieve DIS-synergy**

Source: ICF SH&E Analysis

Management often under-estimates the MRO integration challenges from airline mergers




People

- Labor integration (higher scale wins…)
- Employee dislocation (line Station impact)
- General “cultural” differences

Assets

- Fleet complexity, Lessor and MRO obligations
- Configuration management (standardize cockpit, interiors, components)
- Brand (livery)

Process

- Single Ops certificate?
- Standardize maintenance programs
- Standardize sourcing approaches (make vs. buy)

Technology

- The most complicated and consistently under-estimated task (no close second)
- Standardize time-control tracking (e.g. Zulu vs Local)

Key Takeaways – Global MRO Trends

1. **Significant MRO growth in Russia & CIS – the MRO industry "center of gravity" is transitioning from North America and Western Europe to emerging markets…**
2. **The role of the OEM, and especially the airframe OEM, is rapidly evolving – will you be a spectator or a player…**
3. **A new generation, integrated MRO IT system is no longer a competitive differentiator, but is now a business requirement…**
4. **The key to merging MRO organizations is proper planning and learning from the experience (mistakes) of others…**
5. **The regional jet aircraft market is now very competitive – key to success will be efficient & effective aftermarket support…**

Thank You

ICF SH&E's MRO Advisory Services Include the following:

- **Aerospace Manufacturing Strategy**
- **Aviation Asset Valuations & Appraisals**
- **MRO Market Research & Analysis**
- **MRO Cost & Performance Benchmarking**
- **MRO Information Technology (IT) Assessment**
- **M&A Commercial Due Diligence**
- **MRO Strategic Sourcing Support**
- **Supply Chain Management**
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- **Military Aircraft Sustainment**