



MRO 2008 – EFFICIENT, SAFE & GREEN

Engine MRO Capacity – Up to the Task?

Presented by:

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Passion. Expertise. Results.

Today's Discussion

- ◆ About SH&E
- ◆ Impact of Engine Technology
- ◆ Global Engine MRO Demand
- ◆ Global Engine MRO Supply



SH&E is one of the world's largest aviation consulting firms with over 40 years of industry experience

Technical Consulting

- ◆ MRO Sales & Marketing Strategy
- ◆ MRO Market Research & Analysis
- ◆ MRO Supply Chain Management & Strategic Sourcing
- ◆ MRO Performance Benchmarking & Operations Diagnostics

Appraisal Services

- ◆ Tangible asset valuation
- ◆ Residual value forecasting
- ◆ Lease analysis

Asset Management

- ◆ Sale or lease of assets
- ◆ Lease management
- ◆ Maintenance management
- ◆ Technical inspections

Financing Support

- ◆ M&A commercial due diligence
- ◆ Enterprise valuation
- ◆ Securitization support
- ◆ Operational audits

Restructuring and Bankruptcy Support

- ◆ Service re-alignment
- ◆ Debt & obligation restructuring
- ◆ Recapitalization

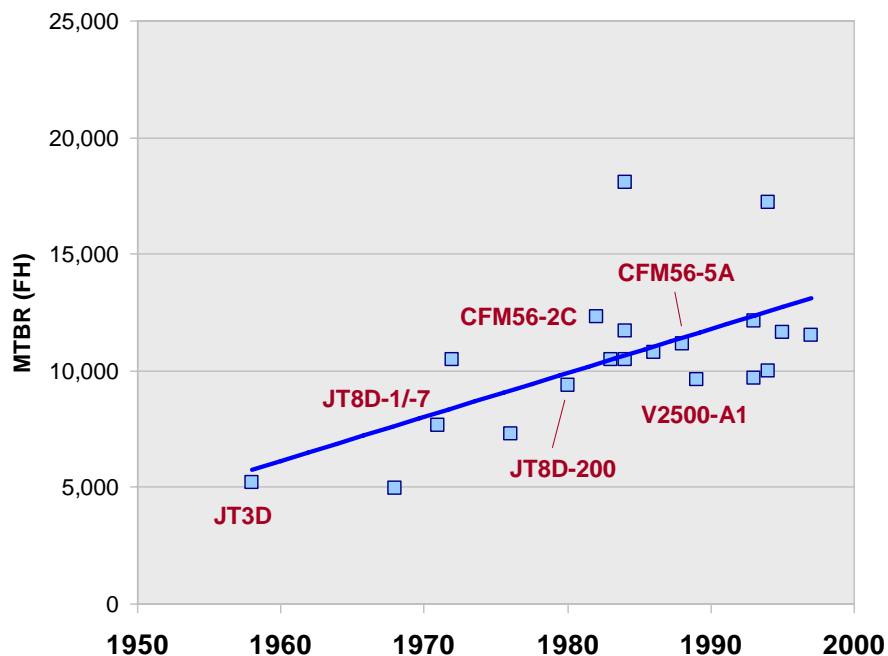


Engine Technological Advances

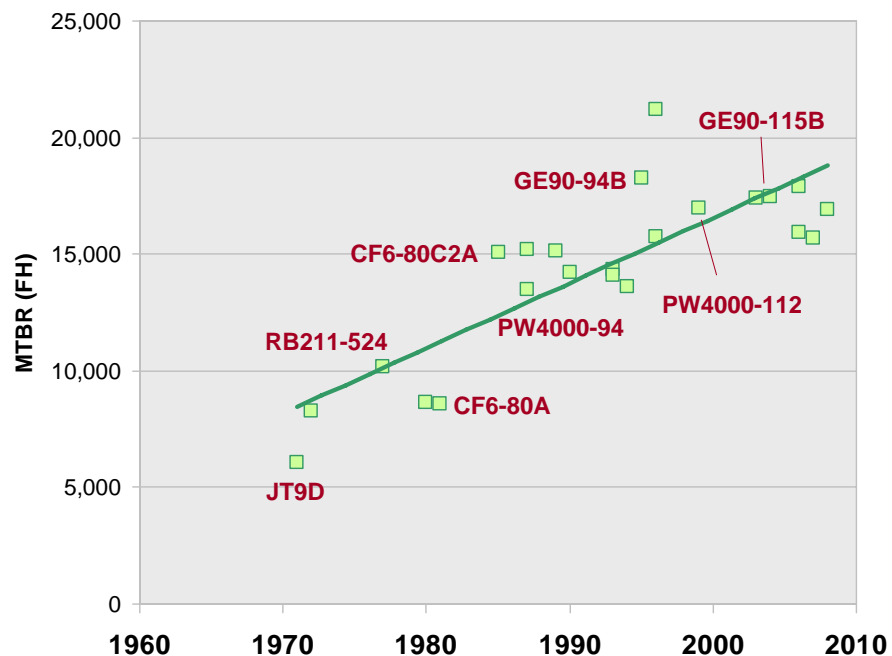
Significant improvements in time on-wing have been achieved over the last several decades

Mature Shop Visit Rates by Entry Into Service Year

Under 45,000 lb_p 2FH/FC

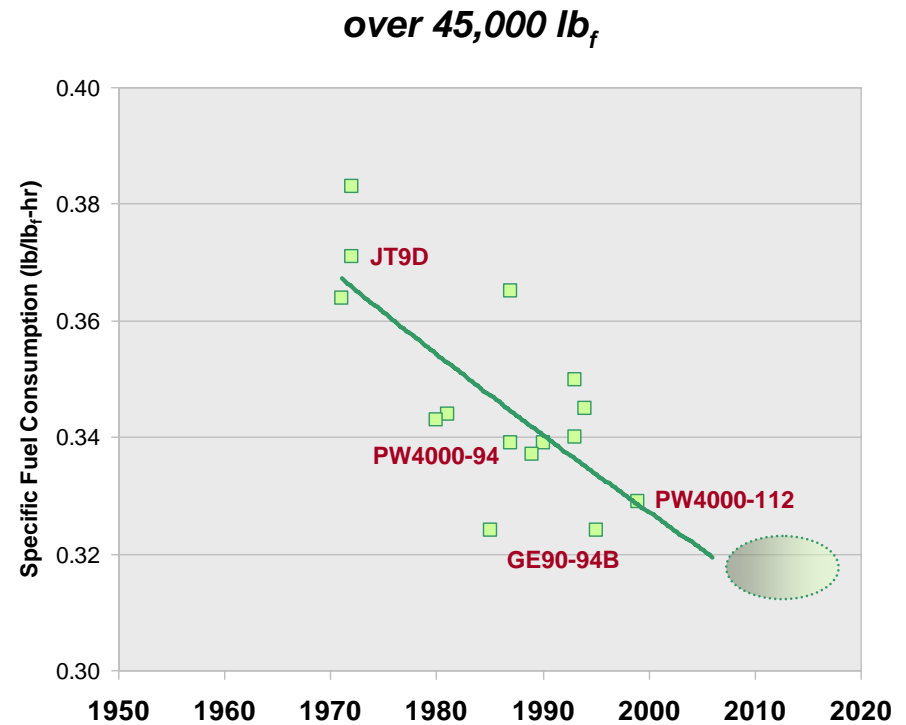
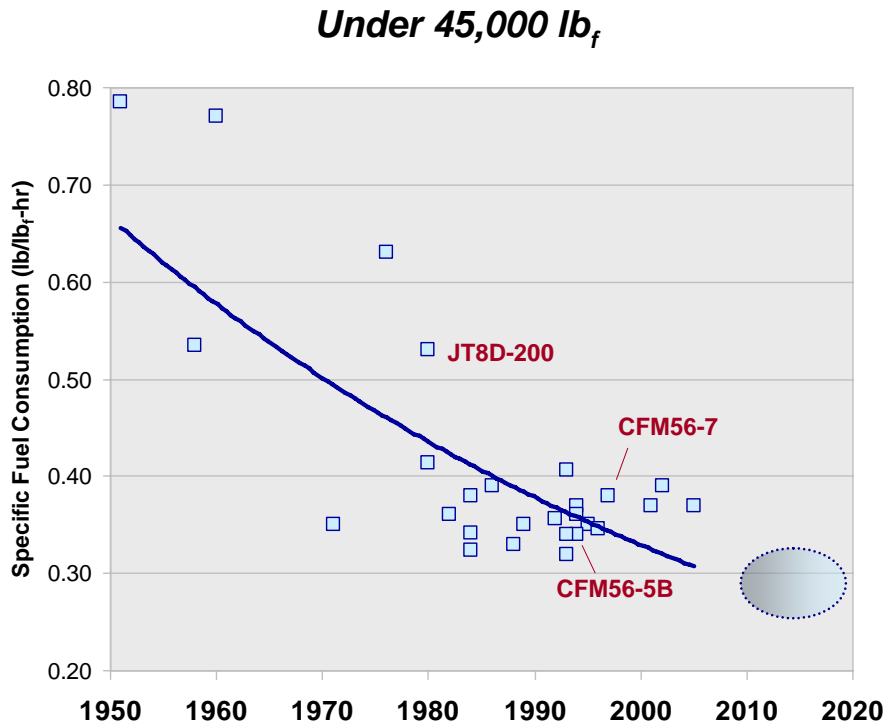


Over 45,000 lb_p 8FH/FC



Newer generation engines have dramatically reduced fuel burn per pound of thrust

Specific Fuel Consumption (lb/lb_f-hr, T-O) by Entry Into Service Year



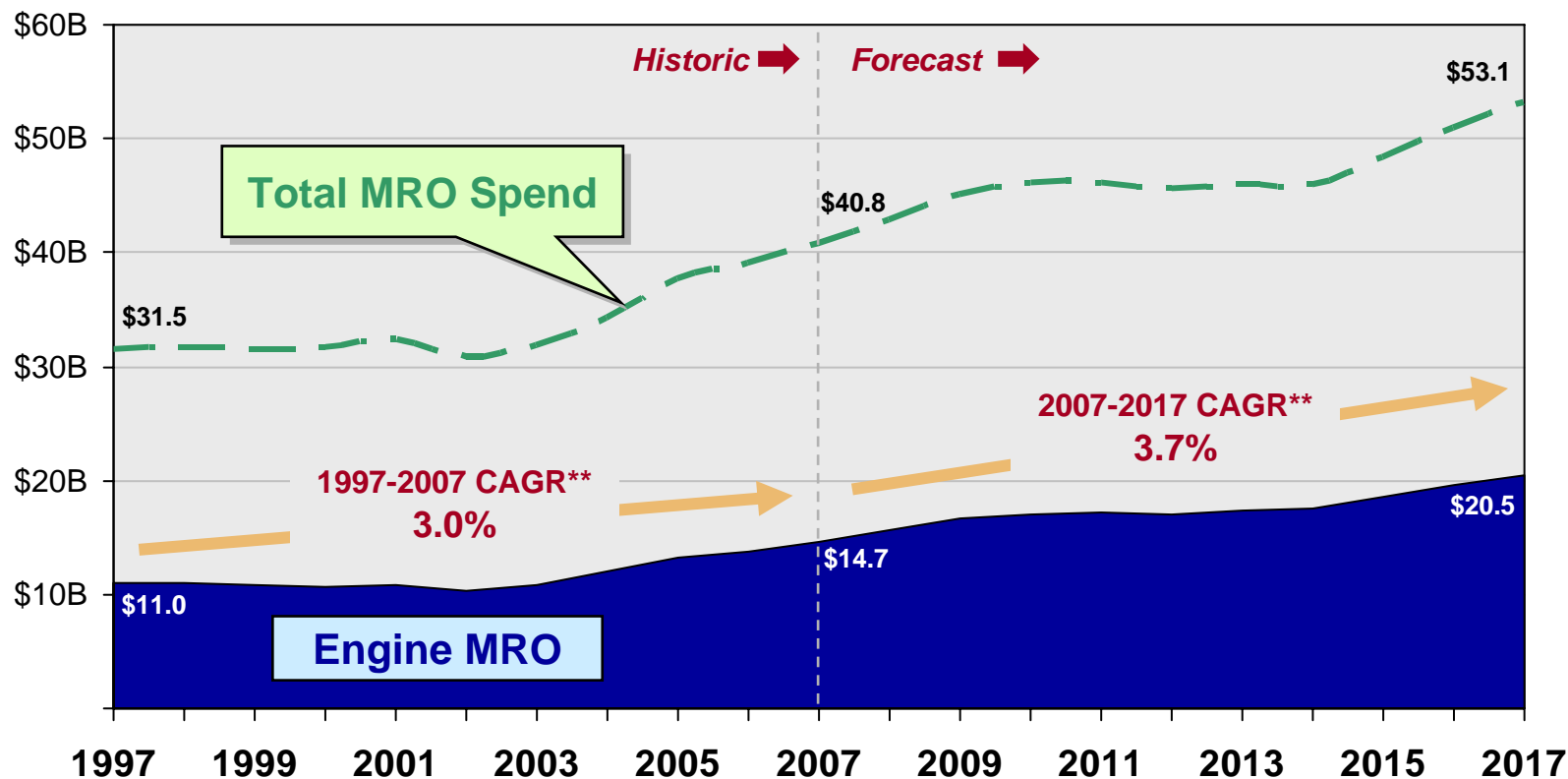


Commercial Jet Engine MRO Demand

The engine MRO market will increase from \$15B today to more than \$20B by the year 2017, in 2008 dollars

Commercial Jet Engine MRO Market

2008 \$USD Billions

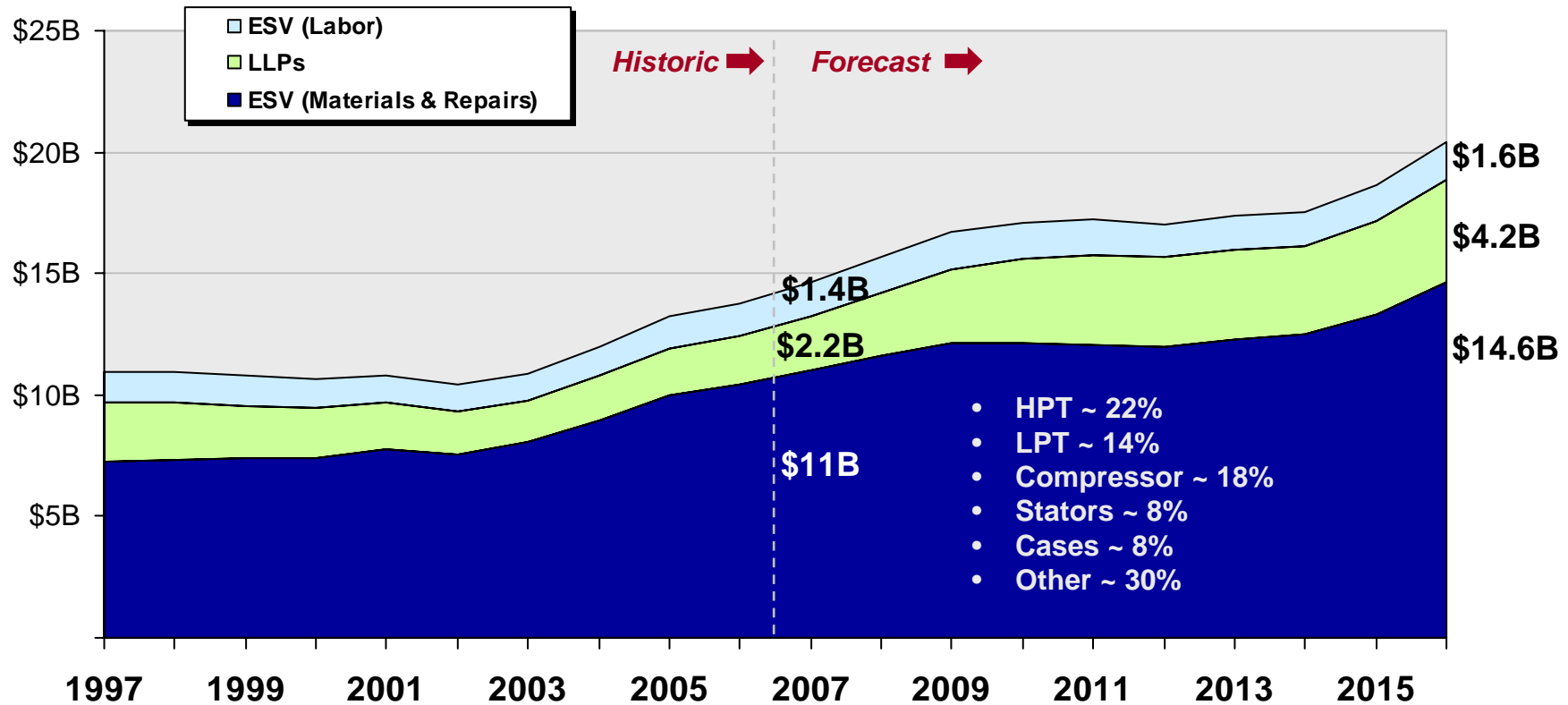


From 36% of all MRO spend today to 39% by the year 2017

Engine materials and repairs have been, and will continue to be, responsible for nearly 75% of engine maintenance costs

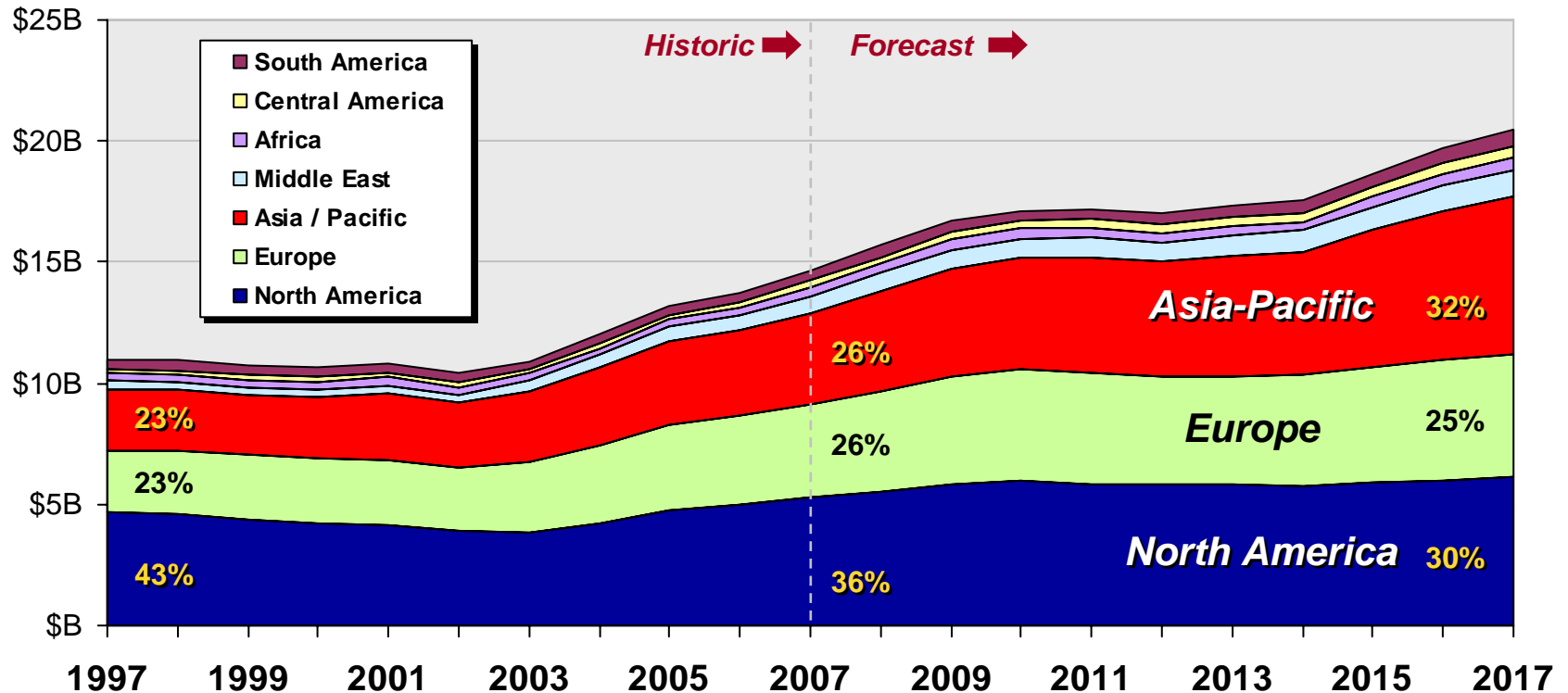
Commercial Jet Engine MRO Market by Category

2008 \$USD Billions



By 2017 the Asia-Pacific fleet will surpass North America as the largest consumer of engine MRO

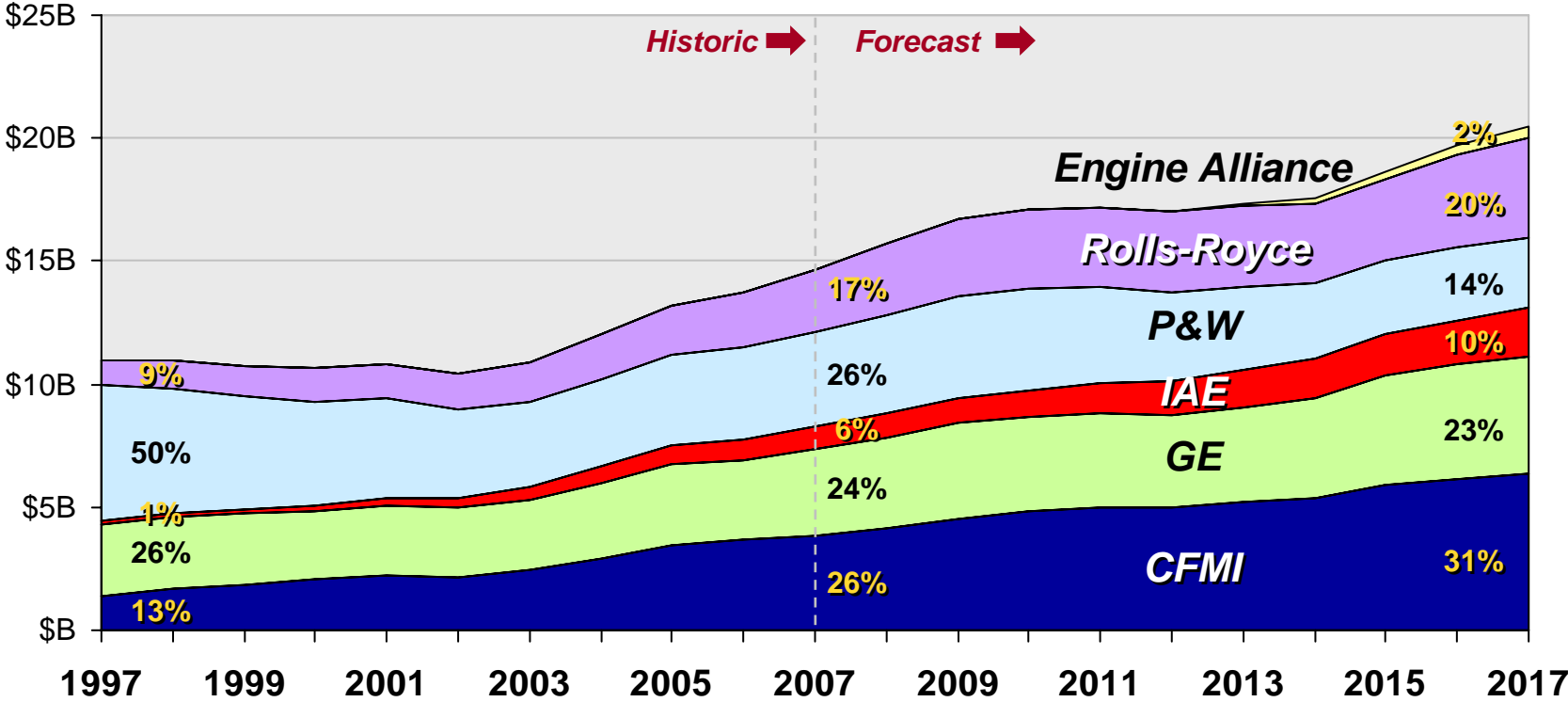
Commercial Jet Engine MRO Market by Consumer Region
2008 \$USD Billions



In 2017, over 90% of engine MRO demand will come from the Asia-Pacific, Europe, and North America regions

CFMI engines will generate the largest demand for engine MRO over the next 10 years, more than \$50 Billion, in 2008 dollars

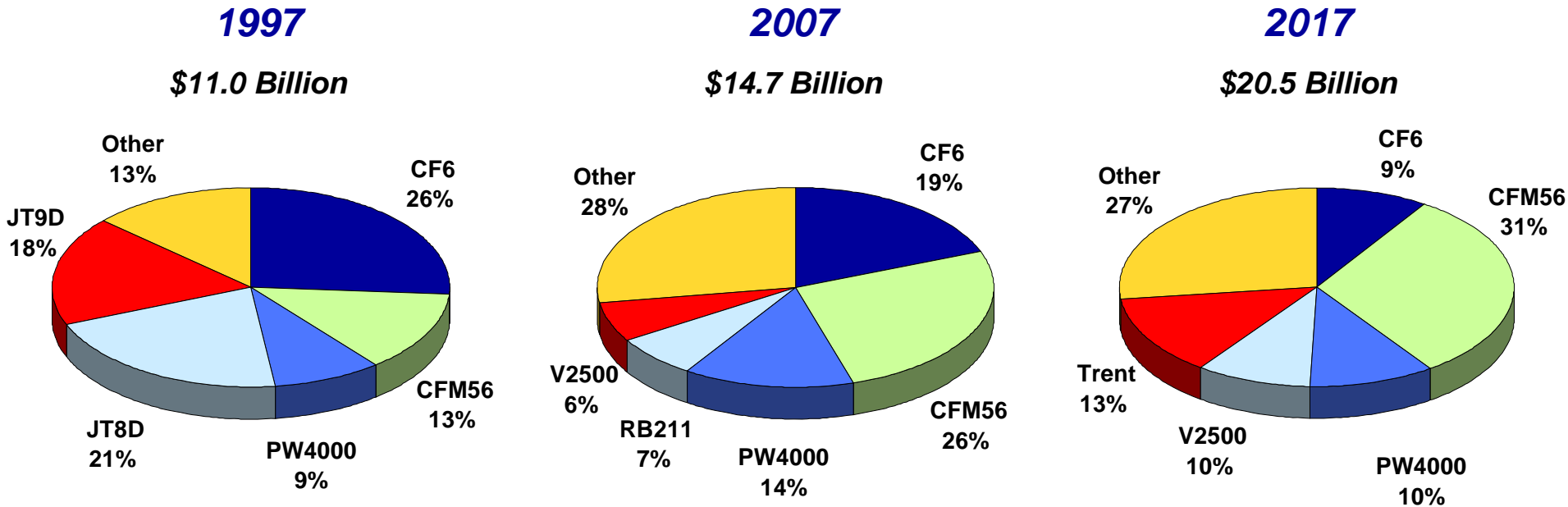
Commercial Jet Engine MRO Market by OEM
2008 \$USD Billions



GE continues to dominate with over a 50% market share of commercial jet engine MRO demand, followed by Rolls Royce in a distant second

The CFM56 family of engines will generate over 30% of all engine MRO spend by the year 2017

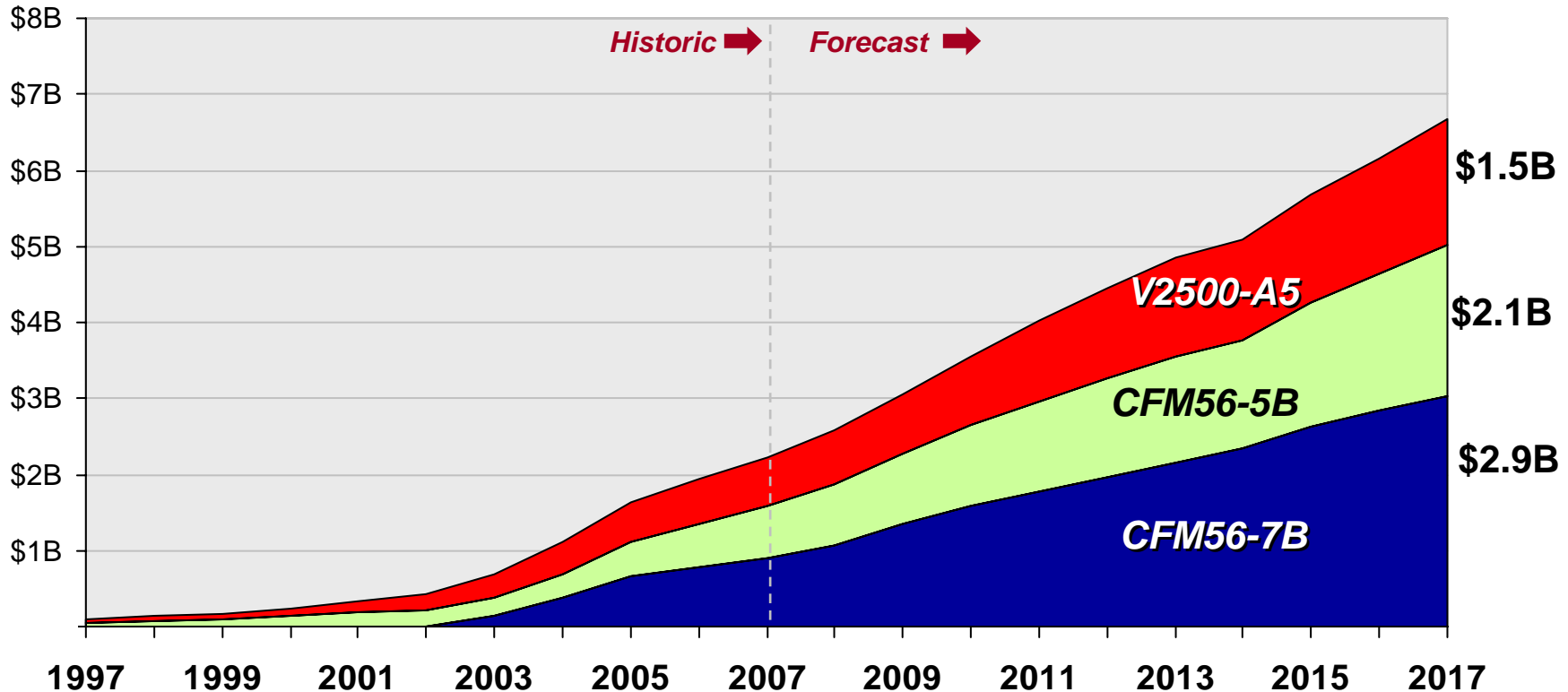
Commercial Jet Engine MRO Market by Engine Family



By 2012, the CFM56-7B will generate the most engine MRO demand, while the CFM56-5B will generate the second largest MRO demand by 2014

The largest engine MRO markets in 2017 will be for modern narrowbody engines, having tripled from \$2B to \$6B

Commercial Jet Engine MRO Market by Engine Family
2008 \$USD Billions



The Infamous Bow Wave....

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INTERNATIONAL

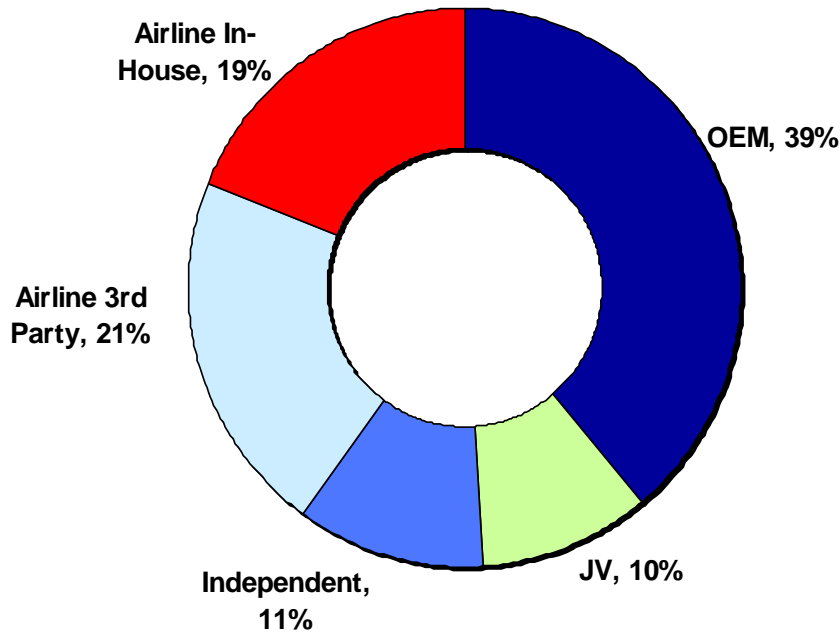


Commercial Jet Engine MRO Supply

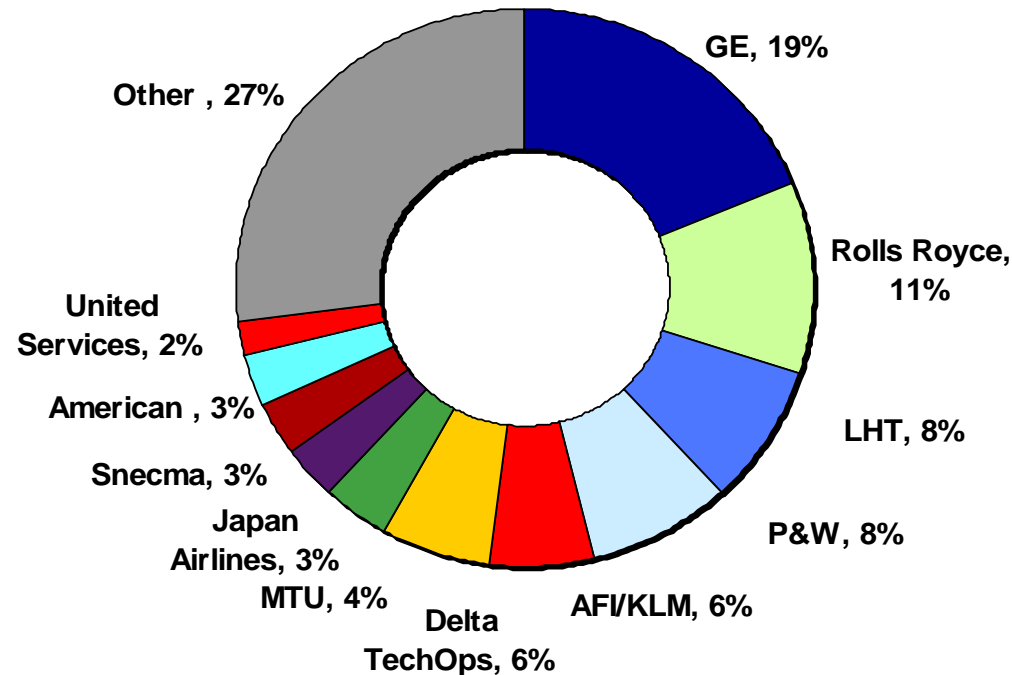
MRO Suppliers – Although airline third party providers continue to leverage their economies of scale, OEM continue to dominate

2008 Engine MRO Suppliers

By Engine MRO Supplier Type



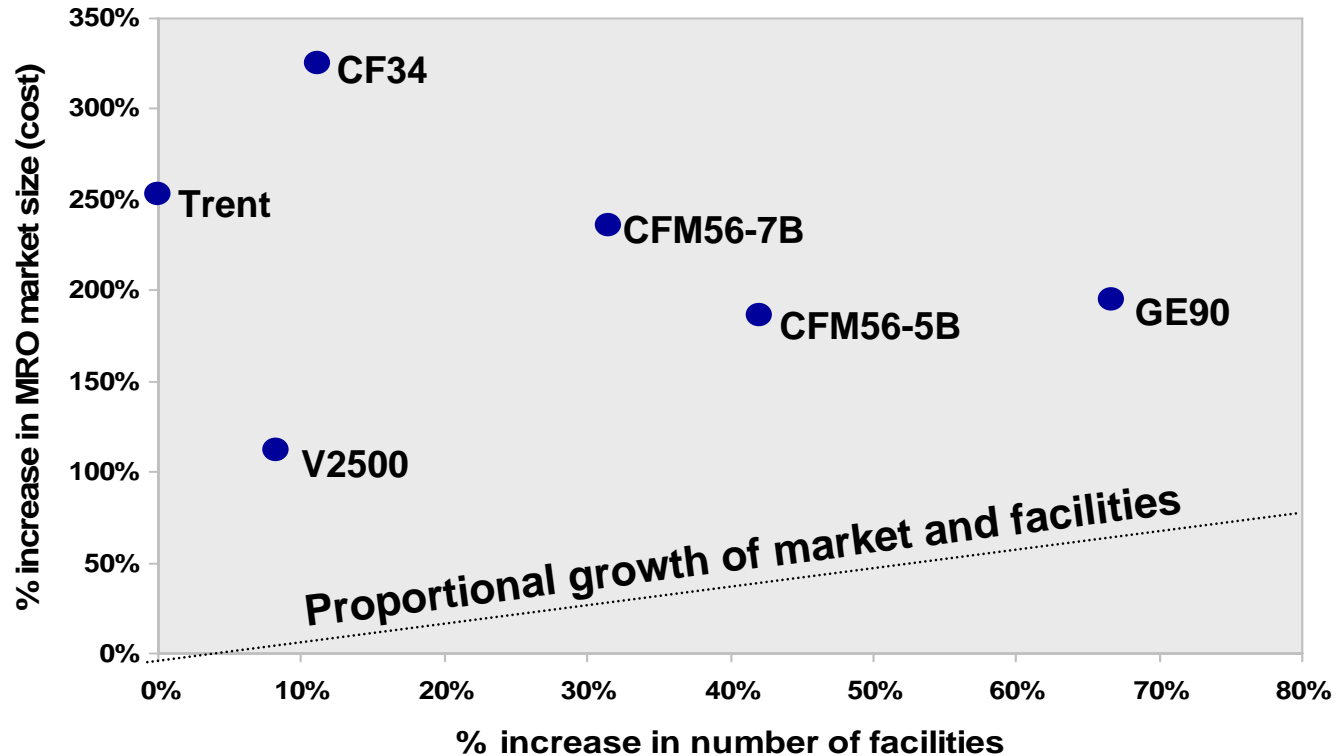
By Engine MRO Supplier



OEM market share of the \$15B engine MRO market has grown by more than 35% over the past decade

Will commercial engine MRO capacity keep up with the increase in demand?

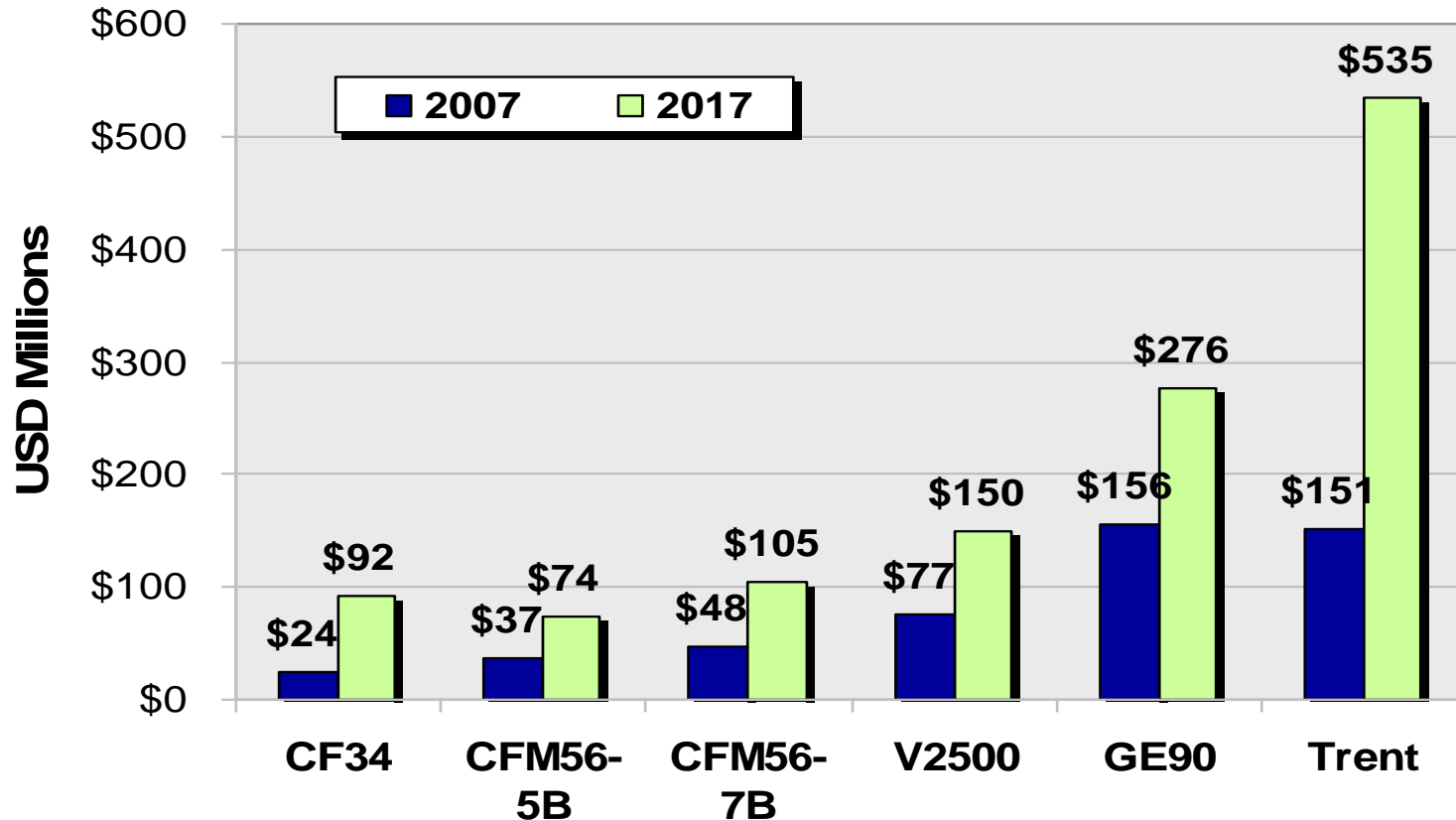
2007 – 2017 Engine MRO Market and Facility Growth



- **The fastest growing engine MRO markets will increase by 100-350% in the next 10 years**
- **The increase in the number of currently planned engine shops is far less, ranging from 0-70%**

Without new engine supplier growth, the market available to each existing and planned new shop will increase...

Engine MRO Market per Shop (Existing & Planned)



Is there currently excess capacity (e.g. single shift operations) or is there a need for more shops?

Thank You

SH&E's dedicated Maintenance & Engineering practice is staffed with highly skilled former airline maintenance and MRO executives. Specific consulting services include the following:

- ◆ Maintenance Operations Diagnostics
- ◆ Market Research & Analysis
- ◆ MRO Sales, Marketing & Pricing Strategy
- ◆ Outsourcing and Insourcing Support
- ◆ On-Site Hangar/Shop Visit Oversight
- ◆ MRO Information Technology Assessment
- ◆ Cost & Performance Benchmarking
- ◆ Supply Chain Management
- ◆ LEAN Continuous Process Improvement
- ◆ Safety & Compliance Audits
- ◆ Cabin Interior Reconfiguration Program Management

