Oliver Wyman’s Aviation, Aerospace & Defense practice is the largest and most capable consulting team dedicated to the industry.

**OUR EXPERIENCE**
- 232 professionals across Europe and North America
- Deep aviation knowledge and capabilities allow the practice to deliver data-driven solutions and provide strategic, operational, and organizational advice

**OUR CLIENTS**
We have worked with more than ¾ of the industry’s Fortune 500 companies, including:
- All major US airlines
- Leading airlines, MROs, OEMs, and independent parts manufacturers in the Americas, Europe, and Asia
- Dominant aerospace and defense firms

**OUR APPROACH**
- **Data-driven**: unbiased benchmarking and forecasting tools to establish problems and identify solutions
- **Innovative**: ideas that are forward-thinking
- **Actionable**: results-oriented recommendations
- **Collaborative**: an emphasis on working with our clients, alongside executives, management, and support teams
This presentation incorporates the betterinsight™ 2016-2026 Global Fleet and MRO Market Forecast and the Oliver Wyman MRO Survey 2016.

The betterinsight™ Global Fleet & MRO Market Forecast Commentary, and related market intelligence data is available at planestats.com/betterinsight.
The future is now
Amid weakening economic conditions, the global airline industry is achieving record passenger volumes, record cargo volumes, and record net profits.

The North American operators are, by far, delivering the strongest financial performance.
Record net profits are due in large part to the glut in the oil market. As oil prices are expected to remain low over the short term, many are concluding that operators will delay retirements, and defer new aircraft.

Crude Oil and Jet Fuel Spot Prices per Gallon by Year

To date, operators have not shown signs of significantly altering fleet plans. OEM order backlogs continue to grow, and new aircraft deliveries are at an all time high.
In order to corroborate trends in deliveries and retirements, we asked operators how the price of fuel was impacting their fleet decisions in the Oliver Wyman MRO Survey 2016

Q: How much longer would oil prices need to stay below $50 to have a real impact on your fleet decisions?

- Already noticing a change: 23%
- 12 Months: 6%
- 18 Months or longer: 71%

Q: Below what sustained oil price would you consider adding older aircraft into your fleet?

- $60-$70: 12%
- $40-$50: 18%
- At no price: 70%

Delivery decisions are made many years in advance and make a very stable and predictable variable that runs independently of macro level factors.
While the fleet is growing at a healthy rate, and the industry is reveling in historic net profits, uncertainties surrounding economic growth, interest rates, and oil prices could disrupt the delicate balance enjoyed today.

We forecast the fleet will increase by nearly 9,900 aircraft by 2026, representing an average annual growth rate of 3.4%.
While the fleet is growing at a healthy rate, and the industry is reveling in historic net profits, uncertainties surrounding economic growth, interest rates, and oil prices could disrupt the delicate balance enjoyed today.

Global In-Service Fleet Forecast by Year

Number of Aircraft

While the fleet is growing at a healthy rate, and the industry is reveling in historic net profits, uncertainties surrounding economic growth, interest rates, and oil prices could disrupt the delicate balance enjoyed today.

No matter which forecast scenario comes to fruition, the winds of change are blowing through our industry.
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**Global In-Service Fleet Forecast by Year**

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Global In-Service Fleet Forecast by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Aircraft</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>18,000</td>
</tr>
<tr>
<td>2017</td>
<td>23,000</td>
</tr>
<tr>
<td>2018</td>
<td>28,000</td>
</tr>
<tr>
<td>2019</td>
<td>33,000</td>
</tr>
<tr>
<td>2020</td>
<td>38,000</td>
</tr>
<tr>
<td>2021</td>
<td>43,000</td>
</tr>
</tbody>
</table>

No matter which forecast scenario comes to fruition, the winds of change are blowing through our industry.

WEAKENED ECONOMY
- GDP
- TRAFFIC
- FUEL PRICES
- INTEREST RATES
While the fleet is growing at a healthy rate, and the industry is reveling in historic net profits, uncertainties surrounding economic growth, interest rates, and oil prices could disrupt the delicate balance enjoyed today.

No matter which forecast scenario comes to fruition, the winds of change are blowing through our industry.
New Technology
Regional Shift
Aircraft Retirements
The increase in new technology will be the prevailing tailwind behind the changes in the global fleet and the airline industry over the next decade.

By the end of the forecast period, next generation aircraft will account for nearly all new deliveries and comprise over half of the global fleet.
Next generation aircraft are equipped with new technologies enabling unprecedented collection and transmission of data at both the system and part level.

Global In-Service Fleet Data Generation per Year by Year

This surge of data, in the hands of a new breed of data scientists and innovative management teams, creates massive potential to change how aircraft are cared for.
Without a clear plan for its collection and application, big data can bring distractions for resource-constrained operators, leading to squandered efforts or abandoned intentions to integrate advanced analytics into MRO.

Q: “Due to aircraft health management we have experienced a noticeable...”

The pathway to a high-impact, productive big data platform will begin with targeted successes on modest improvement initiatives, such as statistically reliability analysis on high-failure parts.
As the mature North American and Western European markets continue to undergo significant re-fleeting efforts and tightly control capacity, there will be a continuing shift to the East.

2016 In-Service Fleet by Region

- North America: 7,491
- Western Europe: 4,942
- Eastern Europe: 1,209
- Latin America: 1,762
- Africa: 1,048
- Middle East: 1,234
- China: 2,460
- India: 408
- Asia Pacific: 3,986

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As the mature North American and Western European markets continue to undergo significant re-fleeting efforts and tightly control capacity, there will be a continuing shift to the East.
Nearly half of the current global fleet is forecast to retire by 2026 with the majority of those being of 1990s vintage. In light of this, we asked operators about their retirement planning.

Nearly 80% reported that retirements are planned at least three years in advance, indicating that short-term industry events are not influencing retirement schedules.
Record increases in retirements are expected to have a significant impact on the availability and use of used serviceable material over the next decade.

**2016-2026 Global Materials Market Forecast**
**USM vs All Other Materials**

<table>
<thead>
<tr>
<th>Year</th>
<th>USM</th>
<th>All Other Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>$30</td>
<td>$30</td>
</tr>
<tr>
<td>2017</td>
<td>$35</td>
<td>$35</td>
</tr>
<tr>
<td>2018</td>
<td>$40</td>
<td>$40</td>
</tr>
<tr>
<td>2019</td>
<td>$45</td>
<td>$45</td>
</tr>
<tr>
<td>2020</td>
<td>$50</td>
<td>$50</td>
</tr>
<tr>
<td>2021</td>
<td>$55</td>
<td>$55</td>
</tr>
<tr>
<td>2022</td>
<td>$60</td>
<td>$60</td>
</tr>
<tr>
<td>2023</td>
<td>$65</td>
<td>$65</td>
</tr>
<tr>
<td>2024</td>
<td>$70</td>
<td>$70</td>
</tr>
<tr>
<td>2025</td>
<td>5.9% CAGR</td>
<td>4.3% CAGR</td>
</tr>
<tr>
<td>2026</td>
<td>$70</td>
<td>$70</td>
</tr>
</tbody>
</table>

Greater utilization of USM material, particularly in 1990’s vintage aircraft, will impact material pricing, and may reduce the cost of an engine shop visit by 10%-20%.
Translating the fleet and market dynamics into MRO, we estimate the 2016 global commercial MRO market was about $68B.

2016 Global MRO Market Forecast
by MRO Segment

- AIRFRAME & MODS $16.0B
- COMPONENT $13.1B
- ENGINE $25.6B
- LINE $12.8B

Engine MRO continues to be the driver of growth in the market.
As MRO is a product of the size, mix, and utilization of the fleet, the market should continue to grow at a robust pace, weathering all but the most traumatic economic shifts.

Global MRO Market Forecast by Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Historical MRO</th>
<th>betterinsight™ Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>$47.7</td>
<td>$67.7</td>
</tr>
<tr>
<td>2011</td>
<td>$50.4</td>
<td>$80.5</td>
</tr>
<tr>
<td>2012</td>
<td>$53.4</td>
<td>$93.3</td>
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<tr>
<td>2013</td>
<td>$56.0</td>
<td>$98.9</td>
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<tr>
<td>2014</td>
<td>$58.0</td>
<td>$104.0</td>
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<tr>
<td>2015</td>
<td>$60.0</td>
<td>$109.0</td>
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<tr>
<td>2016</td>
<td>$62.0</td>
<td>$114.0</td>
</tr>
<tr>
<td>2017</td>
<td>$64.0</td>
<td>$118.0</td>
</tr>
<tr>
<td>2018</td>
<td>$66.0</td>
<td>$124.0</td>
</tr>
<tr>
<td>2019</td>
<td>$68.0</td>
<td>$129.0</td>
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<tr>
<td>2020</td>
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<tr>
<td>2021</td>
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</tr>
<tr>
<td>2022</td>
<td>$74.0</td>
<td>$144.0</td>
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<tr>
<td>2023</td>
<td>$76.0</td>
<td>$149.0</td>
</tr>
<tr>
<td>2024</td>
<td>$78.0</td>
<td>$154.0</td>
</tr>
<tr>
<td>2025</td>
<td>$80.0</td>
<td>$159.0</td>
</tr>
<tr>
<td>2026</td>
<td>$82.0</td>
<td>$164.0</td>
</tr>
</tbody>
</table>

We forecast total MRO spend to increase by over $31 billion by 2026, which would represent a year-over-year increase of 3.9%.
As MRO is a product of the size, complexion, and utilization of the fleet, the market should continue to grow at a robust pace, weathering all but the most traumatic economic shifts.

The uncertainty surrounding global economic conditions, while adversely impacting the size of the global fleet, could benefit the MRO Market.
The Middle East and Africa regions will experience robust MRO growth over the next ten years at an average annual rate of 6.9% and 4.8%, respectively.

**2016-2026 Middle East and Africa MRO Market Forecast by MRO Segment**

![Bar chart showing the forecasted market share of Airframe, Engine, Component, and Line for Middle East and Africa.](image)

**2016-2026 Middle East and Africa MRO Market Forecast Middle East vs Africa**

![Line chart showing the forecasted market share of Middle East and Africa.](image)

Engine MRO spend more than doubles during the forecast period while airframe maintenance remains relatively stagnant.
Across the Middle East and Africa; spend is concentrated in certain countries, else it’s highly fragmented

2016 Middle East and Africa MRO Market Forecast by Operator Country

© Oliver Wyman
In the Middle East, the MRO spend generated by the next generation fleet will grow at more than 28% per annum.

A cautionary note: not all this growth in spend is available to third party suppliers.
Saudi Peninsula
- Fleet Size: 290
- MRO Market: $1.0B
While oil prices have stabilized, the area’s economy is still dependent on this commodity. Growth opportunities exist but are limited and/or focused – it’s critical to get the business case right and do appropriate due diligence before investing capital.

North Africa
- Fleet Size: 314
- MRO Market: $0.7B
The fleet consists of mostly aging turboprops, regional jets and narrow body aircraft. Outsourced MRO market is relatively small. This combined with the political uncertainties makes the sub-region less attractive for those not already operating there.

Sub-Saharan Africa
- Fleet Size: 734
- MRO Market: $1.2B
Declining commodities prices and lower demand from the sub region’s largest importer China currently hamper the economic outlook of the region. Despite on going political turbulence, many look to the long-term prospects of this commodity-rich, high population region.

United Arab Emirates/Qatar
- Fleet Size: 611
- MRO Market: $3.6B
Significant growth is concentrated in Dubai, Abu Dhabi and Doha, but not all MRO supply chain activities are or will be outsourced. OEMs have the most to gain from the large operators as the average fleet age is low. Other MRO supply chain participants must have strong value propositions and the right market entry strategy to convince such large airlines to outsource.

Iran, Iraq, Jordan, Lebanon, Syria
- Fleet Size: 333
- MRO Market: $1.0B
Geopolitical uncertainty still abounds and constrains ability to grow. Lifting of economic sanctions on Iran should allow the gradual improvement in the outlook of economies across the region.
Take the controls and make strategic investments now:

New technology aircraft growth is creating unprecedented change across the value chain.

The mature markets are stagnating, and the nexus of MRO is shifting Eastwards.

Increased retirements will lead to greater availability and use of USM, which will significantly impact MRO costs.

Growth in the Middle East region is highly concentrated; opportunities exist but may be tougher to access than the growth rates imply.

Middle East airlines are among the leading operators of new technology aircraft (scale and experience); this represents a business opportunity.
Oliver Wyman’s annual MRO Survey
For over a decade, we’ve synthesized key trends and issues in the MRO marketplace via a global survey; all participants get detailed feedback

To participate in our annual 2017 MRO Survey, please email: MROsurvey@oliverwyman.com
Thank You and Questions?