Oliver Wyman acquired TeamSAI and integrated the business into CAVOK, its aviation technical consulting and services practice.


OLIVER WYMAN

CAVOK

+ TEAM SAI

= CAVOK

A DIVISION OF OLIVER WYMAN

~150
Dedicated CAVOK employees located in DFW and ATL
(Supported by +250 Oliver Wyman aviation consultants)

+2,300 years of combined airline operations expertise

+70%
of CAVOK staff hold FAA certification/license

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Global Fleet & MRO Market Outlook
The global air transport jet and turboprop fleet will grow by more than 10,000 net new aircraft by 2025

2015-2025 Global Fleet Forecast by Aircraft Class

- Narrowbody aircraft will lead the growth
- Regional jets will actually decline in the mix
- Cargo fleet forecast to grow by 2.3% annually
- Passenger fleet expected to grow at 3.8% annually
- Global fleet will grow on average 3.7% annually over the full forecast period

The growth outlook, however, varies widely from region to region
A 5 pt spread in regional growth rates leads to a significant share shift over the decade ahead

<table>
<thead>
<tr>
<th>Region</th>
<th>2015 Fleet Size</th>
<th>10YR CAGR</th>
<th>2015-2025 Absolute Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>7,420</td>
<td>0.9%</td>
<td>722</td>
</tr>
<tr>
<td>Europe</td>
<td>6,131</td>
<td>2.8%</td>
<td>1,965</td>
</tr>
<tr>
<td>Latin America &amp; the Caribbean</td>
<td>1,720</td>
<td>4.7%</td>
<td>997</td>
</tr>
<tr>
<td>Africa / Middle East</td>
<td>2,204</td>
<td>5.5%</td>
<td>1,562</td>
</tr>
<tr>
<td>Asia Pacific / China / India</td>
<td>6,452</td>
<td>6.1%</td>
<td>5,235</td>
</tr>
</tbody>
</table>

The mature North American and Western European markets will continue to undergo significant reflecting efforts during the next 10 years
A 5 pt spread in regional growth rates leads to a significant share shift over the decade ahead

<table>
<thead>
<tr>
<th>Region</th>
<th>2025 Fleet Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>8,142</td>
</tr>
<tr>
<td>Europe</td>
<td>8,096</td>
</tr>
<tr>
<td>Latin America &amp; the Caribbean</td>
<td>2,717</td>
</tr>
<tr>
<td>Africa / Middle East</td>
<td>3,766</td>
</tr>
<tr>
<td>Asia Pacific / China / India</td>
<td>11,687</td>
</tr>
</tbody>
</table>

The mature North American and Western European markets will continue to undergo significant reflecting efforts during the next 10 years
43% of all new aircraft deliveries will replace old technology aircraft over the forecast period

The systematic elimination and replacement of older aircraft with new technology aircraft will drive significant change is the business for airlines and maintainers.
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The systematic elimination and replacement of older aircraft with new technology aircraft will drive significant change in the business for airlines and maintainers.
The result is a staggering change in fleet mix by 2025

The significant move towards late generation aircraft, in addition to improving airline costs, will undoubtedly impact MRO dynamics.
The fleet dynamics of the period result in a forecast that tops $100 billion by 2025, a 4.1% average annual growth rate.

Global MRO Market Size Forecast by MRO Segment

Global MRO Market Share Forecast by MRO Segment

Airframe Heavy Maintenance costs improve with the new technology while both Engine and Component sectors will take a larger share.
Shadowing the fleet trends, large differences in regional growth rates will lead to a significant shift in MRO demand.

<table>
<thead>
<tr>
<th>Region</th>
<th>2015 MRO Spend ($USB)</th>
<th>10YR CAGR</th>
<th>2015-2025 Absolute Growth ($USB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>$20.0</td>
<td>0.6%</td>
<td>$1.3</td>
</tr>
<tr>
<td>Europe</td>
<td>$17.9</td>
<td>3.3%</td>
<td>$7.0</td>
</tr>
<tr>
<td>Latin America &amp; the Caribbean</td>
<td>$3.2</td>
<td>7.3%</td>
<td>$3.3</td>
</tr>
<tr>
<td>Africa / Middle East</td>
<td>$7.5</td>
<td>5.5%</td>
<td>$5.3</td>
</tr>
<tr>
<td>Asia Pacific / China / India</td>
<td>$18.3</td>
<td>6.6%</td>
<td>$16.5</td>
</tr>
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Asia/Pacific, China, & India will be challenged to build the necessary infrastructure capable of handling the volume of MRO the combined region will demand.
Shadowing the fleet trends, large differences in regional growth rates will lead to a significant shift in MRO demand.

Asia/Pacific, China, & India will be challenged to build the necessary infrastructure capable of handling the volume of MRO the combined region will demand.
Asian Fleet & MRO Market Outlook
Passenger traffic is soaring in Asia, outpacing fleet growth by 3.0%. Still, the young fleet is growing very quickly.

2015 PASSENGER TRAFFIC (RPK) GROWTH
9.1%

2015 CURRENT FLEET
6,452

+6.1%

2015-2025 FLEET CAGR

6,500+

2015-2025 AIRCRAFT DELIVERIES

1,300+

2015-2025 AIRCRAFT RETIREMENTS
In 10 years, over 56% of Asia’s fleet will be new technology aircraft requiring new technical skills and capabilities.

### Top 10 Asia Aircraft Families - 2015

<table>
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<th>Aircraft Family</th>
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<tr>
<td>A320C/NEO</td>
</tr>
<tr>
<td>777</td>
</tr>
<tr>
<td>737NG/MAX</td>
</tr>
<tr>
<td>A330</td>
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<td>747</td>
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</tr>
<tr>
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</tr>
<tr>
<td>A380</td>
</tr>
<tr>
<td>A340</td>
</tr>
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<td>ATR</td>
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### Top 10 Asia Aircraft Families - 2025

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<tr>
<td>A380</td>
</tr>
<tr>
<td>ATR</td>
</tr>
<tr>
<td>C919</td>
</tr>
</tbody>
</table>
Oil prices have plummeted over the past year and could remain low over the short term. Many are concluding that this will cause airlines to alter fleet plans and drive an increase in MRO.

Our view: Long term, oil prices will likely recover, OEM order books will remain largely unaffected, and net fleet growth will progress as forecasted.
A sharp increase in the rate of deliveries drives a world-leading 6.6% growth rate in MRO spend over the next ten years.

Despite the solid growth, aftermarket participants will still need to have an aggressive and innovative plan to maintain or grow market share.
Many different dynamics are at play in a region comprised of 44 countries and states; differences in individual economies and resource availability will produce uneven growth in the region.
Australia/New Zealand
- Fleet Size: 689
- MRO Market: $1.6B
Highly affected by strong currencies, operators and MROs in these countries are finding it difficult to compete with the emerging economies of the region.

Indonesia/Malaysia/Singapore
- Fleet Size: 877
- MRO Market: $2.4B
With a broad range of MRO capabilities, the countries act as the hub of the Asian MRO Market. Continued investments in capabilities and skilled labor will help the countries continue to grow and remain highly competitive with new entrants in the Philippines, Thailand, and Vietnam.

Japan
- Fleet Size: 593
- MRO Market: $1.7B
Japan suffers from a lack of workforce. The country will continue supplying materials to the industry, but it does not have the human resources to take on a significant amount of contracted MRO work.

Philippines/Thailand/Vietnam
- Fleet Size: 475
- MRO Market: $1.5B
Countries can open a broad market for themselves by targeting MRO work within Asia. Introducing new capacity and developing a skilled labor force to meet future demand in the region.

China/Hong Kong/Taiwan
- Fleet Size: 2,467
- MRO Market: $7.5B
China will be a key driver of growth in the region for the next decade. This rapid growth, coupled with rises in labor costs will ultimately cause the operators in the region to look south and east to fulfill their maintenance needs.
Fleet changes and technological advances will create turbulence for the MRO business

**OEM’s increased aftermarket presence**
- Increased aftermarket market share for the newest generation of aircraft

**New repair capabilities required**
- Decisions necessary enter new markets for each of airframe, engine and component repairs

**Less maintenance**
- Health monitoring and predictive maintenance will reduce overall time-on-tool requirements for individual checks with fewer repairs

**Increased use of data analytics**
- Critical new source of value to the aftermarket driven by those who design the best algorithms and most rigorous data management

Market participants will need aggressive and innovative plans for growth
MRO Survey Results

OLIVER WYMAN

ANNUAL MRO SURVEY 2015
Oliver Wyman’s 2015 MRO Survey identified a slew of new technologies that are poised to come to market.

Most prominent new technologies by 2020 (All respondents):

- Aircraft Health Monitoring Systems: 66%
- Predictive Maintenance: 66%
- “Live” maintenance through wearable and mobile technology: 57%
- Composite repair capabilities: 35%
- New repair technology: 26%
- Additive manufacturing: 25%
- Artificial intelligence: 6%
- Drone-supported maintenance: 4%
The collection, storage, aggregation and analysis of data will be key factors in aircraft health monitoring and predictive maintenance.

Who is best positioned within the industry to benefit from predictive maintenance?

- **Airlines**: 65%
- **OEMs**: 19%
- **Too early to predict**: 9%
- **MROs**: 7%
- **PMA Manufacturers**: 0%
However, digesting innovative change is not standard fare for the MRO industry…

Survey respondents completed this sentence: “The MRO industry innovates…”

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>... periodically</td>
<td>39%</td>
</tr>
<tr>
<td>... sporadically</td>
<td>27%</td>
</tr>
<tr>
<td>... primarily as a response to OEM innovation</td>
<td>21%</td>
</tr>
<tr>
<td>... frequently</td>
<td>13%</td>
</tr>
</tbody>
</table>

- Historically, little need to build internal organizations devoted to R&D, corporate strategy and product development
- Lack of regular disruptions decrease relative:
  - Devoted resources
  - Tried and tested review processes
  - Time and attention of executives
  - Clarity of ownership / leadership
  - Assessment infrastructure
- Internal ability to recognize, assess and prepare for change is not a core capability for the industry
...and though they have a vision, many organizations struggle with how to rapidly evaluate and bring innovative ideas to market.

Positive survey responses

- Top management has a clear, shared vision and strategy for growth in new business areas (76%)
- Use a strategic planning method to visualize areas of opportunity and identify the most promising prospects (68%)
- Our innovation process allows us to quickly translate identified opportunities into plans and get sign-off (43%)
- We quickly pilot ideas and roll out fast-to-market programs (33%)

Decreasing impact; More difficulty bringing vision to market
So what’s really inhibiting change in MROs?

- The primary inhibitors of innovation at my organization are:

  - Budget / capital availability: 50%
  - Inability to prove innovative process / product / service will offer margin benefits over current techniques: 44%
  - Total cost / lack of clear payback: 44%
  - Organization resistance: 35%
  - Review and approval process: 32%
  - Lack of personal capability: 21%
  - Implementation difficulties: 21%
  - Lack of need for change: 6%

How can you eradicate these barriers within your own organization?
New technologies will reshape our perception of MRO aftermarket commercial offers.

Advances could cut or redistribute 15 to 20 percent of MRO spend, but also spawn new business models and revenue streams.
Take the controls and make strategic investments now: Technologies will likely come online faster than anticipated

Additive Manufacturing (3D Printing)
• Quickly gaining traction
  – A350 will feature 3D-printed plastic and metal brackets
  – GE will introduce 3D-printed fuel nozzles in its CFP LEAP engine
  – Out-of-production parts can be printed “on-demand”

Aircraft Health Monitoring (AHM) and Big Data
• Expected to be a significant driver of innovation over the next five years
• Boeing recently invested $100M into expanding AHM
• A 787 flight can generate 500GB of data

Augmented Reality and Automated Inspection Tech
• Augment reality allows for live audio and visual communication with OCC
• Robots used for visual inspections and non-destructive testing
  – Highly efficient
  – Highly accurate
Time to disengage the Autopilot

Is your corporate Auto Pilot engaged?

• Focusing solely on business as usual is a risky strategy in the coming years
• Relying on current commercial offers, sales practices, resources, will challenge an MRO’s future business
• Advances could cut 15-20% of MRO spending from the aftermarket
• But also spawn new business models and revenue streams
• Amounts to a reduction or redistribution of $10-15B among current industry players & new competitors
• MROs and operators must actively choose technologies to develop and exploit
• Those that fail will end up as innovation takers, ceding further aftermarket control to competitors
The future is now
Oliver Wyman insights come directly from the industry, and we value your insights as they help shape the future.

If you are interested in shaping our 2016 MRO Survey in January, send an email to MROSURVEY@OLIVERWYMAN.COM

Include a subject line with the phrase “count me in” and you’ll receive the survey upon its release

Thank You!