WINDS OF CHANGE
2016-2026 GLOBAL FLEET & MRO MARKET FORECAST

APRIL 5, 2016

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

**OUR EXPERIENCE**
- +230 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.
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.
Contrary to popular belief, jet fuel prices and economic indicators have not had a direct effect on the delivery of new aircraft.

Of all factors that could have an effect on new aircraft deliveries, net profit from two years prior has the strongest correlation coefficient (70%)
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.
Over the past year, status changes to 3,581 aircraft have lead the in-service fleet to experience a net growth of 755 aircraft, representing a 3.2% annual growth rate.

**Year Over Year Changes to the In-Service Fleet by Transaction Type**

<table>
<thead>
<tr>
<th>Transaction Type</th>
<th>2015 In-Service Fleet</th>
<th>2016 In-Service Fleet</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>New aircraft delivery</td>
<td>1,633</td>
<td>24,540</td>
<td>1,633</td>
</tr>
<tr>
<td>Sent to storage</td>
<td>(1,198)</td>
<td></td>
<td>-1,198</td>
</tr>
<tr>
<td>Formally retired</td>
<td>(166)</td>
<td></td>
<td>-166</td>
</tr>
<tr>
<td>Involved in an accident</td>
<td>(28)</td>
<td></td>
<td>-28</td>
</tr>
<tr>
<td>Transferred to a non-commercial operator</td>
<td>(18)</td>
<td></td>
<td>-18</td>
</tr>
<tr>
<td>Storage for conversion into a freighter</td>
<td>(3)</td>
<td></td>
<td>-3</td>
</tr>
<tr>
<td>Transferred to a commercial operator</td>
<td>8</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Completed freighter conversion</td>
<td>49</td>
<td></td>
<td>49</td>
</tr>
<tr>
<td>Unknown prior exclusion</td>
<td>59</td>
<td></td>
<td>59</td>
</tr>
<tr>
<td>Removed from storage</td>
<td>419</td>
<td></td>
<td>419</td>
</tr>
</tbody>
</table>

Net change: 755 aircraft, representing a 3.2% annual growth rate.
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 could disrupt the delicate balance we are enjoying today.

**Global In-Service Fleet Forecast by Year**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Aircraft</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>24,540</td>
</tr>
<tr>
<td>2011</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td></td>
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<tr>
<td>2013</td>
<td></td>
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<td>2020</td>
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<td>2021</td>
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<td>2022</td>
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<td>2024</td>
<td></td>
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<tr>
<td>2025</td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td>34,437</td>
</tr>
</tbody>
</table>

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 could disrupt the delicate balance we are enjoying today.

Global In-Service Fleet Forecast by Year

No matter which forecast scenario comes to fruition, the winds of change are blowing through our industry.
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 could disrupt the delicate balance we are enjoying today.

Global In-Service Fleet Forecast by Year

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

BLACK SWAN

- GDP
- TRAFFIC
- FUEL PRICES
- INTEREST RATES
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<th>Year</th>
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<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.

**Likely Alternate Scenarios**
- CLOUD NINE
- STRENGTHENED ECONOMY
- WEAKENED ECONOMY
- BLACK SWAN

**Historical Fleet**
- 24,540

**betterinsight™ Forecast**
- Linear growth

**Likely Alternate Scenarios**
- Light blue shading
- Linear growth

**Best/Worse Case Alternate Scenarios**
- Light green shading
- Linear growth

© Oliver Wyman
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

Billions of Gigabytes

<table>
<thead>
<tr>
<th>Year</th>
<th>Data Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>1</td>
</tr>
<tr>
<td>2017</td>
<td>4</td>
</tr>
<tr>
<td>2018</td>
<td></td>
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<tr>
<td>2019</td>
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<td>2024</td>
<td></td>
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<tr>
<td>2025</td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td>98</td>
</tr>
</tbody>
</table>

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 monitoring 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 boisterous shift towards Asia.
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2026 In-Service Fleet by Region

- North America: 8,067
- Western Europe: 5,820
- Eastern Europe: 1,453
- China: 5,771
- Middle East: 2,313
- India: 706
- Africa: 1,213
- Asia Pacific: 6,477
If you are thinking about growth, you should be thinking about Asia.
Seeking to mitigate the financial risk from historically volatile fuel prices and to operate more efficiently, operators around the world are discarding smaller regional jets and turboprops to move up to narrow-body aircraft.

The cargo fleet will always play an important role in air service, but it’s relative share of the fleet will decrease over the next decade. New generation passenger aircraft offer more cargo space, and competition from ships, trucks, and trains is mounting.
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.

**Q: When does your organization start planning for a fleet retirement?**

- **1 Year**: 16%
- **2 Years**: 5%
- **3-5 Years**: 47%
- **5+ Years**: 32%

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.

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%.
Though growing, the USM market is not without challenges. OEMs are currently the largest customers of USM, and it is expected that their control of the market will continue to grow as they look to regain material pricing power.

Q: What is your current activity or near team (next 12 months) plan to purchase used serviceable material (USM) for aircraft maintenance in lieu of purchasing new or repairing an existing part?

- Not a priority: 15%
- Use it occasionally: 15%
- Use it occasionally for cost analysis: 34%
- Aggressively incorporate USM in all activities: 37%

Q: In five years, who will exert the greatest control over the surplus market?

- Other: 5%
- MROs: 5%
- Airlines: 10%
- OEMs: 80%
Translating the fleet dynamics into MRO, we forecast the 2016 global commercial MRO market to be $67.7B.

Engine MRO continues to be the driver of growth in the market.
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.

Global MRO Market Forecast by Year

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

Global MRO Market Forecast by Year

Billions of US Dollars

$67.7

The uncertainty surrounding global economic conditions, while adversely impacting the size of the global fleet, could benefit the MRO Market
When singling out North America the picture looks quite different. The North American fleet is forecast to have an average annual growth rate of less than 1% as operators continue to refleet at unprecedented rates.

Additionally, the influx of new-build next generation aircraft, and the systematic elimination of aging fleets is expected to cause stagnation in the MRO Market.
With market stagnation expected, if you are thinking about growth in North America, you should think about how to compete on:

Q: In the next five years, the top three elements of differentiation and Competitive advantage for MROs will be:
Take the controls and make strategic investments now:

- New technology aircraft are creating unprecedented needs for data analysis
- The mature markets are stagnating, and the nexus of MRO is shifting to Asia
- The regional jet and turboprop markets will decline as operators upgauge to narrowbodies
- Increased retirements will lead to greater availability and use of USM, which will significantly impact MRO costs
- Price and customer service are the driving levers to compete in a stagnant MRO market
Our intelligent forecast products are available for direct purchase at planestats.com/betterinsight