GLOBAL FLEET & MRO MARKET ECONOMIC ASSESSMENT 2018-2028

PREPARED BY:
OLIVER WYMAN

Air Transport Fleet & MRO

Fleet Size	26,307
2018-2028 Fleet Growth Rate	3.7%
MRO Market Size	$77.4B
2018-2028 MRO Growth Rate	4.0%

Business Aviation Fleet & MRO

Fleet Size	32,029
MRO Market Size	$12.3B

Global Civil MRO Employment

Firms	4,878
Small/Medium Enterprises (SME)	80.7%
Maintenance Employee	380,156

U.S. Civil MRO Employment

Firm	4,025
Small/Medium Enterprises (SME)	84.7%
Maintenance Employees	184,772

U.S. Economic Activity

Maintenance, Repair, and Overhaul	$21.3B
Parts Manufacturing/Distribution	$22.7B
Total Economic Activity	$44.0B

ARSA

FOREWORD

The analysis in this report is provided by Oliver Wyman for ARSA and its membership.

Oliver Wyman's Global Fleet & MRO Market Forecast Commentary 2018–2028 marks our firm's 18th assessment of the 10-year outlook for the commercial airline transport fleet and the associated maintenance, repair, and overhaul (MRO) market. We're proud to say that the annually produced research, along with our Airline Economic Analysis (AEA), has become a staple resource of aviation executives—whether in companies that build aircraft, fly them, or work in the aftermarket, as well as for those with financial interests in the sector through private equity firms and investment banks.

This research focuses on airline fleet growth and related trends affecting aftermarket demand, maintenance costs, technology, and labor supply. The outlook reveals significant changes that are important to understand when making business decisions and developing long-term plans.

As you will see from the report, the next decade holds great opportunities and challenges for the industry as both technological innovation and the move away from traditional energy sources redefine business as usual across industries and the globe. This will be an era of disruptive growth, driving companies to ask tough, fundamental questions about what it will take to stay relevant and expand.

In conjunction with the Fleet and MRO Forecast, we conduct an annual survey on hot topics, critical issues, and new opportunities across the maintenance, repair, and overhaul space. To participate in this year's edition, or if you have additional questions please contact the research team at MROsurvey@oliverwyman.com.

Oliver Wyman's Aviation Competitive & Market Intelligence team, partners, and vice presidents are available to assist with any questions about this forecast, as well as the AEA. We hope you find the data and insights valuable as you refine your business models and develop strategies for moving forward.

Best regards and wishes for a wonderful 2018,

Steve Douglas, Vice President

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

These are heydays for the commercial aviation industry as well as businesses supporting it from the maintenance, repair, and overhaul (MRO) sector. For the first time in airline history, carriers recorded three consecutive years of record or near record profits, thanks to constrained fuel prices and operational efficiencies. Rising demand for air travel is keeping production lines at aircraft, engine, and component manufacturers busy and setting records. Lower oil prices, along with the willingness of airlines to spend on upkeep, are resulting in delayed retirements of older jets, which in turn provide more business for the MRO industry because of their additional servicing needs. And despite recent political instability and rising global tensions, aviation seems headed for more of the same—at least over the short term.

Across economies—both developed and developing—increases in gross domestic product (GDP) and disposable income, as well as expanding middle classes, are producing an unprecedented global demand for passenger air travel and cargo transport. In China, where the size of the middle class now equals the population of the United States, demand for air travel is expected to grow 9.5 percent annually between 2018 and 2028, despite a slight slowing in economic growth over the same 10 years.

While for decades air travel rose in tandem with GDP, increased demand this year—and in the next several—will help it outpace economic growth in most regions, particularly in emerging markets like Asia and Latin America. In Asia, for instance, air travel is expected to expand 8.3 percent in 2018, while real GDP—that is, GDP adjusted for inflation—will rise 5.6 percent. Even in more mature economies, this trend is evident: In 2017, air passenger miles rose four percent in North America versus a 2.2 percent increase in GDP and eight percent in Europe versus GDP growth of 2.5 percent. In Eastern Europe, where little growth was expected, the industry is seeing airlines such as Budapest-based Wizz Air place large aircraft orders. Wizz expects delivery of 282 Boeing 737s between now and 2026.

Myriad reasons have led to this intensified demand for air travel. They include rising disposable income in emerging markets, expanding numbers globally of well-off retirees with a propensity to travel, an increase in digital connectivity worldwide through the use of digital boarding passes, greater Wi-Fi accessibility, and on-board tablet usage that makes flying easier. Additionally, a spike in the number and size of low-cost carriers and ultra-low-cost carriers has created downward pressure on airfares and other travel costs.

Responding to the demand, US airlines increased available seat miles (ASM) 7.3 percent during 2017 across both domestic and international operations. The year-over-year growth was the largest since the 2007–2009 worldwide economic recession, according to the 2018 Oliver Wyman Airline Economic Analysis (AEA).

The swelling demand continues to drive expansion of the global fleet. Where in our 2017–2027 forecast we projected annual growth averaging 3.4 percent, our current outlook ratchets up that yearly increase to 3.7 percent.

Inevitably, all this spells more business for the major aircraft manufacturers, pushing production rates to levels never seen before for commercial aircraft. The two largest, Boeing and Airbus, have reported they expect their production of Boeing 737s and A320s to reach an unprecedented 60 aircraft per month each sometime in 2019. This compares with 42 per month as recently as 2015—a jump of 43 percent in just four years.

By 2028, our forecast projects, the worldwide fleet will total 37,978, up from the 2018 total of 26,307. Narrow-body aircraft will be the biggest beneficiary of this expansion, increasing from about 56 percent of the fleet in 2018 to 66 percent in 2028, thanks to operating costs, range, and capabilities that allow them to encroach on territory once reserved for wide-bodies.

By 2028, 55 percent of the fleet will have been designed and built after 2000 and boast the advanced systems, materials, and components that will help keep operating costs down over the near term. We do not expect that recent consolidations—particularly those in Europe—or mergers to come will interrupt this transformation of the fleet.

With this gradual changeover to newer aircraft, airlines will retire older, less fuel-efficient models—although at a slightly slower rate than expected last year. Because of strong demand and production challenges with a few of the newer engines and aircraft, such as the PW1000G and A350, some airlines are deferring retirements to give themselves more flexibility to deal with unexpected problems and delays. It's a smart risk-management strategy that allows airlines to incorporate next-generation aircraft more seamlessly. (See our Forbes.com article, Nov. 1, 2017 for more details on this strategy.)

According to our forecast, 54 percent of the aircraft to be retired over the next decade date to the 1990s. An additional 34 percent were built in the 1980s, and 12 percent were produced in either the 1970s or post-2000. Those most likely to be mothballed are smaller-capacity narrow-body planes, regional jets, and turboprops. By 2028, jets built in the 1990s will drop from two-thirds of the global fleet to 41 percent. By that year, aircraft built in 2010 or later—equipped with advanced sensors, data collection, analytics, and autonomous functions—will represent more than 36 percent of the fleet.

The commercial air transport MRO market is growing at a similar clip, with total MRO spending expected to rise to $114.7 billion from $77.4 billion in 2018. That's a jump of 48 percent on an average four percent compound annual growth rate (CAGR); in 2017, our forecast projected a slightly lower 3.8 percent CAGR. The expansion is back-end loaded, with growth averaging 3.5 percent for the first five years, increasing the total to $91.9 billion by 2023, and rising to 4.5 percent yearly growth between 2023 and 2028.

Prospects for growth in air travel and the technological innovation disrupting all sectors of aviation is spawning mergers and acquisitions. That's true for the aftermarket, too, with Illinois-based AAR's agreement to buy two Canadian MRO facilities from Premier Aviation and China's HNA Aviation Group's purchase of Swiss-based SR Technics as prime examples. The trend in MRO is seeing the number of players cut while the scale of those left standing simultaneously increases.

Some of the fastest growth is projected for MRO operations owned by aircraft manufacturers and other major original equipment manufacturers (OEMs), such as engine maker General Electric. Boeing, for instance, has set a $50 billion goal for its aftermarket services as part of its effort to capture more life-cycle value out of its aircraft. That represents a tripling of its current revenue from the aftermarket.

Our research indicates OEMs that service engines handle about 53 percent of the market, while airlines and their affiliated MRO operations control 64 percent of the airframe maintenance market. OEMs handle about 58 percent of the component MRO aftermarket.

As airlines begin to favor small and midsize wide-bodies, such as Boeing's 777 and 787 and Airbus' A350, another maintenance challenge will present itself—a function of how doing better can sometimes cause unexpected problems. For instance, newer aircraft like the 787 and A350 have longer airframe maintenance intervals, essentially extending the time between scheduled maintenance downtime. While this has a positive impact on airlines' bottom lines, it causes a small problem for them keeping up their interiors. Whereas conventional check intervals once provided carriers a time slot to refurbish interior components—such as seats, overhead bins, and lavatories—newer, technologically advanced aircraft with extended check intervals no longer afford timely opportunities for cabin repairs. This can cause image problems for airlines, given their renewed emphasis on customer experience, and may leave some passengers wondering where the new aircraft are.

One new technology that could shake up the aftermarket later in the decade is 3-D printing, also called additive manufacturing. Using models built through computer-aided design, 3-D printing can produce virtually any solid object—even those with complex architectures—in a range of materials, including plastic, ceramic, and metal. For aerospace manufacturers, this has been a boon for producing prototypes, an activity that accounts for half of additive manufacturing today.

While potentially transformative, the technology has had only a limited impact. The cost of the equipment and OEMs' reluctance to share proprietary designs make it difficult for the MRO industry to adopt 3-D printing for spare parts or for the aftermarket to derive any tangible benefit from the new technology. That's less the case for the OEMs, which have incorporated additive manufacturing into a few operations and may expand its use in the future.

While the forecast for aviation, fleet growth, and the MRO market is basically bullish, there are risks on the horizon. Fast growth often leads to strained capacity and higher costs as pent-up demand allows suppliers to raise rates and workers to seek higher wages. The MRO industry is no exception, and companies are beginning to feel the pinch, particularly when it comes to finding qualified mechanics.

In mature economies especially, a scarcity of technicians trained to service both the older and newer model aircraft will put pressure on payrolls over the next decade. As we reported last year, the retirement of baby boomer mechanics and the lack of interest in the job among millennials will produce a shortfall in the United States by 2022, with a nine percent gap projected between the supply of aircraft technicians and the demand for them by 2027. This shortage could produce problems for the aviation industry just as the fleet is expanding and technologically sophisticated aircraft are being incorporated.

The aviation industry as a whole is more resilient after years of restructuring and improved management, but the growth and prosperity are not evenly distributed. While emerging-market economies showed strong growth in the decade following the 2007–2009 global financial crisis, industry profits during those 10 years were primarily concentrated in the advanced economies of the United States and the Eurozone, where the industry was busy consolidating and restructuring. North American and European airlines controlled a combined 46.5 percent of airline capacity in 2017, but accounted for more than 70 percent of carrier profits, according to the 2018 Oliver Wyman Airline Economic Analysis and data from the International Air Transport Association (IATA).

Moving forward, that dearth of profits could prove problematic for airlines in developing nations faced with burgeoning consumer classes demanding more air travel. Over the next decade, more than three-quarters of the pickup in global growth will be fueled by emerging economies, especially China and India.

The industry also faces uncertainties over global regulation aimed at reducing emissions in compliance with the Paris Climate Accord and as a result of the implementation of Brexit, the United Kingdom's decision to leave the European Union (EU). While the aviation industry has been working on biofuels as a possible route to reduced emissions, it's unclear whether progress on that solution will be enough to meet unfolding environmental regulations, coming at this point mostly from European and Asian efforts to meet the Paris reduction targets. And while there have been warnings of dire consequences with a "hard" Brexit in aviation, it seems unlikely that either side will allow that to happen, given the importance of transportation to both the EU and Britain.

That said, there are few foreseeable stumbling blocks that could derail the expansionary outlook for either the fleet or the MRO industry. If anything, our research for 2018–2028 shows acceleration of the growth trends we reported in earlier research.

FLEET AND MRO FORECAST SUMMARY

REGION	AFRICA	MIDDLE EAST	ASIA PACIFIC	CHINA	INDIA	LATIN AMERICA	NORTH AMERICA	EASTERN EUROPE	WESTERN EUROPE	WORLD
2018 Fleet										
Narrow-body	453	538	2,074	2,536	394	1,060	4,064	786	3,187	15,092
Wide-body	178	758	1,335	381	61	174	1,229	145	1,012	5,273
Regional jet	144	64	219	129	2	273	1,834	189	456	3,310
Turboprop	305	24	640	0	54	250	703	133	523	2,632
Total	**1,080**	**1,384**	**4,268**	**3,046**	**511**	**1,757**	**7,830**	**1,253**	**5,178**	**26,307**
2028 Fleet										
Narrow-body	703	841	3,729	6,024	969	1,596	5,368	1,120	4,688	25,038
Wide-body	273	1,267	1,694	708	106	337	1,528	165	1,299	7,377
Regional Jet	52	25	257	325	14	228	1,671	220	368	3,160
Turboprop	188	64	806	33	86	224	480	79	443	2,403
Total	**1,216**	**2,197**	**6,486**	**7,090**	**1,175**	**2,385**	**9,047**	**1,584**	**6,798**	**37,978**
Fleet Growth Rates										
2018–2023	1.0%	5.6%	5.0%	10.4%	11.7%	3.3%	1.5%	2.2%	3.5%	4.2%
2023–2028	1.4%	3.9%	3.5%	7.2%	5.8%	2.9%	1.4%	2.5%	2.1%	3.3%
2018–2028	**1.2%**	**4.7%**	**4.3%**	**8.8%**	**8.7%**	**3.1%**	**1.5%**	**2.4%**	**2.8%**	**3.7%**
2018 MRO (US$ Billions)										
Airframe	$0.8	$1.5	$3.2	$1.8	$0.4	$1.1	$4.7	$1.1	$4.4	$19.0
Engine	$1.0	$5.7	$6.6	$2.2	$0.8	$1.4	$7.9	$1.3	$5.8	$32.7
Component	$0.4	$0.8	$2.1	$1.2	$0.3	$0.8	$4.0	$0.6	$2.8	$12.9
Line	$0.3	$0.9	$2.2	$1.4	$0.3	$0.7	$3.2	$0.6	$3.2	$12.8
Total	**$2.5**	**$8.9**	**$14.1**	**$6.5**	**$1.8**	**$3.9**	**$19.9**	**$3.5**	**$16.2**	**$77.4**
2028 MRO (US$ Billions)										
Airframe	$0.7	$2.2	$4.4	$3.7	$0.7	$1.3	$4.8	$1.1	$4.6	$23.5
Engine	$1.5	$8.4	$9.8	$7.6	$1.2	$2.7	$10.4	$1.6	$9.3	$52.6
Component	$0.6	$1.5	$3.5	$3.3	$0.7	$1.2	$4.7	$0.8	$3.7	$20.0
Line	$0.4	$1.4	$3.2	$3.1	$0.5	$1.0	$3.9	$0.8	$4.1	$18.5
Total	**$3.4**	**$13.5**	**$20.9**	**$17.8**	**$3.2**	**$6.2**	**$23.8**	**$4.3**	**$21.7**	**$114.7**
MRO Growth Rates										
2018–2023	3.5%	5.0%	5.3%	10.5%	5.8%	3.5%	–0.5%	0.2%	2.7%	3.5%
2023–2028	2.4%	3.6%	2.7%	10.7%	5.4%	5.8%	4.2%	3.8%	3.2%	4.5%
2018–2028	**3.0%**	**4.3%**	**4.0%**	**10.6%**	**5.6%**	**4.7%**	**1.8%**	**2.0%**	**3.0%**	**4.0%**