TITANS OF MRO
TRENDS AND ANALYSIS

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MRO industry growth will continue over the next decade but will be driven by Asia Pacific and will be marked by greater original equipment manufacturer (OEM) participation.

Other trends are the continuing low price of fuel and the entry of less-maintenance-intensive aircraft like the Boeing 787 and the Airbus A350 into the world fleet. In addition capabilities such as satellite-enabled, high-bandwidth connectivity may make big data analytics affordable for component and even airframe MRO.

The latest aircraft available to airlines have been designed to require less maintenance and have components with longer mean time between unscheduled removals (MTBURS), said Marcel Versteeg, managing director of VZM Management Services. However, the indications are that shop visit “costs of the components and engines are significantly higher due to the more advanced technologies, which will at a later stage ‘compensate’ for the higher reliability,” he added.

In the near term the continuing low price of fuel due to overcapacity and sluggish economic growth has slowed the retirement of older aircraft, with a positive effect for MROs, Versteeg noted.

The modifications market also will grow strongly as airlines rebadge their fleets, Plucker predicts. Referring primarily to cabin and avionics modifications, he sees revenue growth from $4 billion to $5.5 billion from 2015 to 2020, or about a 7.1 percent compound annual growth rate.

Singapore Technologies Aerospace (ST Aero), a subsidiary of ST Engineering and one of the largest MROs, also regards modifications, including conversions and cabin interior retrofits, as a business opportunity. It expects modifications growth of about 6 percent annually, according to president, Lim Serh Ghee. ST Aero offers not only cabin design and upgrade turnkey solutions, but also seat development via its new joint venture with Tenryu, which recently received a Singapore technical standard order certificate of approval for seats, Lim said.

The global MRO market is worth $60 to $70 billion, growing to nearly $100 billion in the next nine to 10 years, analysts say. Wayne Plucker, director, North America, aerospace and defense, for Frost & Sullivan, estimates the commercial MRO market growing from $65 billion in 2015 to $78 billion by 2020, or a 3.7 percent compound annual growth rate for the half-decade. ICF International (ICFI) forecasts 2015-2025 growth from $64.3 to $96 billion, or 4.1 percent per annum. Oliver Wyman projects growth from $67.7 billion in 2016 to more than $98.9 billion by 2026, or about 3.9 percent a year.

ICFI estimates that engine services demand will grow from 40 to 41 percent of total MRO demand between 2015 and 2025, component MRO services will stay the same, at 22 percent, but that line maintenance will decrease from 17 to 16 percent, and that airframe maintenance will decrease from 14 to 13 percent of total demand. Engines will continue to be the largest – and most OEM-dominated – sector.

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Pemco’s strategy for success includes four cornerstones: teammates, customer service, Lean, and metrics according to CEO Pastor Lopez.

Airline MRO

Lufthansa Technik (LHT) and Air France Industries KLM Engineering & Maintenance (AFI KLM E&M) revenues rose in 2015 against 2014. During the first three quarters of 2016, AFI KLM E&M’s third-party maintenance revenues increased 16.4 percent, compared with the same period in 2015. Revenues increased from 3.4 billion euros in 2014 to more than 4 billion euros in 2015. The Franco-Dutch MRO, which describes itself as second among multiproduct players, had an order book value of $8.4 billion at year-end 2015.

LHT’s revenues increased in 2015, and increased again in the first six months of 2016 by double digits, revealed Frank Berweger, senior vice president, sales, for the Americas. With over $6 billion revenue and over 800 customers worldwide, Lufthansa Technik is the largest non-OEM provider of MRO services, he stated.

Both stress OEM alliances. AFI KLM E&M’s Vincent Metz, director of strategy, cites the MRO’s Component Services Program with Boeing for the 777 and 737, including the 737 MAX, and the EPCOR unit’s agreement with Honeywell on auxiliary power units (APUs). AFI KLM E&M also has a joint venture (JV) with Safran for airfoil repair.

“Apart from competitive pricing, key factors that will determine success in the MRO business in the future will be the ability to contribute to shaping products and services in the global marketplace,” LHT’s Berweger affirmed. “Collaboration with OEMs will enable us to share risk and know-how.”

Both MROs stress global expansion to provide regional support.

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LHT, for example, has been adding to its airframe capabilities in Puerto Rico and the Philippines and has opened a new component supply warehouse in Hong Kong. Spairliners, a JV between the two MROs, opened a warehouse and logistics center for component supply in Singapore.

Regionally, Berweger expects highest growth in Asia and the Americas, “where we continue to gain market share.” The unit sees “a very positive business environment” for its engine services and also “strong demand” for its component MRO solutions for new aircraft such as the A350, A320neo, and Boeing 737 MAX. Connectivity solutions such as WiFi on board is a third sector of strong demand, he says.

AFI KLM E&M is one of the major power-by-the-hour (PBH) providers worldwide, for engines, components, or full support, Metz says. Some examples: A350 full support for Air Caraibes, A350 and 787 component support for Thai, 12 customer airlines for 787 component PBH program, A320 component support for JetBlue, GE90 support for Air China, Air Canada, and Aeroflot, and GEnx support for Xiamen Air.

Engine MRO

ICF projects engine MRO to grow from approximately $25.72 billion in 2015 to $39.36 billion in 2025, or about 4.4 percent annual growth. MTU Maintenance, an independent and OEM-affiliated MRO, sees the sector growing from $21 billion today to almost $46 billion by 2025. MTU Maintenance further predicts an increase in

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worldwide shop visits for commercial jet engines of about 4 percent per year between now and 2025.

**GE Aviation**

Although GE Aviation did not reveal its aftermarket revenues, its estimated commercial aviation engine services backlog including engines not yet in service is $119 billion, Dwyer said. He expects about 4,300 overhauls in 2016 on all models combined, about 35 percent of which GE Aviation performs in its own shops.

Although the OEM and its partners, CFM International and Engine Alliance, account for some 36,000 engines in service with about 700 airlines, Dwyer explained that “there are about 60 other airline or independent MRO shops that compete to win overhauls on GE, CFM, and [Engine Alliance] engines or perform MRO for their own fleets of engines”. He describes the GE Aviation and CFMI support models as “open and competitive” adding that less than half of the engines in GE Aviation’s new engine backlog have service agreements.

GE Aviation asserts that the level of choice provided to airline customers is a ‘unique and differentiating aspect’ of the GE and CFM aftermarket model. “Customers have a choice for MRO and the service contract type, whether they want a long-term agreement, time & material agreement, or another structure,” said Dwyer. This level of choice differs from “other service providers who require a service [contract] when an engine [is] purchased,” he added. Furthermore, “the overhaul and material segments are highly competitive on GE and CFM engines...”

Dwyer points out that engines like the CFM56-5B and CFM56-7B have increased dramatically in durability, compared to their predecessors. A CFM56-5B or -7B typically operates eight to nine years before its first overhaul. This compares with about three years for the CFM56-3 during its mid-life point, he explained.

**PEMCO Strategy**

Despite challenges in the airframe MRO market, such as perceived overcapacity, fragmentation, and a shrinking pool of qualified mechanics, PEMCO has significantly improved performance in 2016 vs. 2015. The company’s strategy for success includes four cornerstones: teammates, customer service, Lean, and metrics, explains PEMCO CEO Pastor Lopez.

Lean has been a performance driver – one of the reasons for the dramatic increase in the year-to-year number of aircraft serviced -- from 181 in 2015 to an estimated near-600 in 2016. “On top of that, our on-time performance improved from 84 percent in 2015 to over 94 percent in 2016,” Lopez says.

Business is looking good as the company moves into 2017, he adds. “In 2016 we began three new programs that run into 2017 and beyond. Two programs are with legacy carriers and one is with an LCC [low-cost carrier]. All three programs are tracking well and our customer service, along with quality and on-time performance, has been exceptional.”

The “most significant trend in the [narrow-body and regional aircraft] space,” where PEMCO specializes, “is U.S. customers ... shifting work from South and Central America back into the U.S. as costs continue to rise,” Lopez says. “Also, the logistics of supplying parts and representatives to some of these countries represent added costs that can be easily mitigated within the U.S.”

PEMCO highlights customer service and Lean process optimization, which come together in energizing the workforce. “We truly believe in having an engaged workforce...,” Lopez says.
There is a reason airlines and lessors turn to PEMCO for maintenance, conversion, and engineering: quality workmanship.

Since CEO Pastor Lopez arrived in 2014, he has articulated a vision of operating on four fundamental cornerstones: teammates, customer service, Lean, and metrics. It is these four cornerstones that drive the company’s dedication to providing top-quality service to its customers.

The company’s Lean program is led by industry veteran Ben Macre, who has experience on the airline and MRO side. Teams are put together every month to work on week-long transformations of a business area. This has proved very beneficial as all the changes are owned by the teammates. As a result, PEMCO has seen a tremendous morale increase.

“I strongly believe in having an engaged workforce that truly understand the role they play in making a company successful,” said Lopez. The company measures all aspects of its business.

Every functional area has a set of metrics reviewed on a monthly basic. “This way, there are no surprises,” shared Lopez.

PEMCO offers airframe maintenance, line maintenance at Tampa International Airport, modifications, AOG field support, and support shop services. The company continues to be a world leader in B737 Classic conversion with over 150 aircraft converted and 70-plus STCs.

In 2016, PEMCO celebrated its 100th B737-300 passenger-to-freighter redelivery, was named a preferred MRO service provided for the MRJ by Mitsubishi Aircraft Corporation, and serviced over 500 aircraft at its Tampa facilities.
to compete with the economics of new aircraft, so flexibility and tailored maintenance solutions are critical, Sylvestro said.

P&W's mature engine portfolio includes engine maintenance and asset management solutions that reduce costs while maintaining residual value with OEM standard parts and repairs. Targeted workscopes for specific time horizons and for meeting lease return conditions, material packages containing a combination of new and serviceable material, high used serviceable part fill rates and innovative life-limited part (LLP) solutions with serviceable LLPs and buyback programs drive down maintenance costs for mature engines, he says.

Rolls-Royce
Rolls-Royce has reorganized its aftermarket networks and added new service lines. The company created a network of Customer Service Centers to accelerate and localize maintenance decisions. The first of these, launched in Singapore in 2015, has improved customer issue resolution responsiveness by more than 50 per cent, according to Lesley So, head of civil aerospace marketing-services. Nodes serving the Americas, Greater China, the Middle East, and Europe 'went live' in January 2016, he added.

The OEM also named an independent MRO, Delta TechOps, to its list of Approved Maintenance Centers (AMCs), the first AMC with no Rolls-Royce equity stake. Another independent AMC, Mubadala, was announced in 2016. Mubadala will build a facility that will work on the Trent XWB which powers the A350 XWB.

Rolls-Royce has also sharpened focus on its older engines. Although the average Trent engine is just over eight years old, some are maturing. In response the OEM has launched programs such as TotalCare Flex for managing engines to final retirement and SelectCare, which involves an agreed-upon number of fixed-price engine overhauls backed by engine health monitoring. American Airlines, which launched Rolls-Royce’s revolutionary TotalCare program in 1999, is the first SelectCare customer.

Rolls-Royce’s presence in the wide-body sector has grown from a single-digit share in the early 1990s to 45 percent today, So said. At the same time the company’s installed engine fleet has grown from 2,160 in 1995 to 4,600 today and will hit 7,450 by 2025, the company predicts, with biggest growth in Southeast Asia, China, and the Middle East.

MTU Maintenance
MTU Maintenance enjoys the best of both worlds, both as an independent MRO and as an OEM-networked MRO. Its parent, MTU Aero Engines, is a risk and revenue sharing partner on certain current and next-generation products from International Aero Engines, Engine Alliance, P&W and GE.

Health Monitoring
The most near-term technology-induced shakeup will come via health monitoring. This will be a two-edged sword for MRO, predicts Wayne Plucker, director, North America, aerospace and defense, for Frost & Sullivan. This branch of big data – which will be made cost-effective by the advent of high-bandwidth Ka- and Ku-band satellite constellations – will help to eliminate maintenance missteps and reduce airline MRO needs, he says. The big question will be who owns the data – the operator, the OEM, the MRO, or the third-party doing the analysis of the data. “There’s no good answer,” he says, “but it’s something that eventually will have to be absolutely answered.”

The engine MROs are doing this now. But eventually “the whole airplane will be sensed up,” Plucker predicts. Data analytics, for example, will make a big difference to providers of components, he says. Because it opens the door to on-condition maintenance, it could save airlines a lot of money.

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ST Aero is remarkable for its ability “to get into every nook and cranny and to do it very well,” observed Plucker. A key differentiator for ST Aero is its proven reliability in on-time delivery, president Lim stated. “Over the years we have always delivered on-time, over and over again.”

ST Aero is an integrated service provider and “one of the few MRO providers in the world with an in-house aircraft design engineering capability that can offer … a wide range of customized engineering and design solutions.”

The company underlines its relationships with OEMs. Some key partnerships include Boeing and Airbus; GE for On-Wing Support of GEnx-1B and -2B engines; CFM with CFM56 support; P&W on high-tech component repairs; and UTC Aerospace Systems for 787 nacelle systems.

“We see opportunities in the USA, the biggest MRO market globally, and in China, the fastest-growing MRO market,” said Lim says. By year-end, 2016, ST Aero expected to complete a second hangar in Guangzhou, China, which can accommodate two wide-bodies and one narrow-body. Another new hangar in Pensacola, Florida, accommodating two wide-bodies, is slated for operation in 2018. ST Aero also supports nearly 900 aircraft worldwide under component Maintenance-By-The-Hour contracts.

Europe is a major target for ST Aero, increasing its share in Elbe Flugzeugwerke GmbH (EFW) to 55 percent, with the remainder held by Airbus. EFW will be ST Aero’s center for passenger-to-freighter conversions, aircraft MRO, and engineering services in Europe. EFW, meanwhile, is setting up another company in Germany to produce lightweight components, mainly floor panels and cargo linings, for single-aisle Airbus aircraft.

**AAR**

AAR describes itself as the largest MRO in the Americas and the third-largest airframe MRO in the world in man-hours and revenues. The company’s man-hours grew about 4 percent in FY 2016 over the 5 million recorded in the previous year.

AAR has added capacity for wide-body work, with FAA certification of a new MRO in Rockford, Illinois. What’s more, “AAR has also started to see an increase in heavy maintenance work from Latin American airlines and repatriation from Asia,” said Dany Kleiman, MRO Group vice president.

The MRO is also growing its power-by-the-hour business. The number of aircraft under contract for PBH component inventory management and repair services has increased from 800 to 1,200 since last year and more are coming soon, said Deepak Sharma, president of AAR supply chain. “Our growth has been with airlines in Europe, the Middle East, Asia, and Africa.” AAR customizes its PBH programs, so airlines can choose just rotable pool access or just component repair, he said.

“We can repair components in-house at our … component shops in New York and Amsterdam or manage repairs done by third-parties where we do not have in-house capacity.” AAR’s subsidiary, UK-based Airinmar, also provides repair management support services.

Many customers use AAR’s bundled services to increase efficiency, Sharma said. Most of the company’s recent airline PBH contracts include inventory management and repair. For airlines with new fleets, AAR also provides “nose-to-tail contracts” that include not only inventory management and repair, but also airframe maintenance and landing gear. “It is much more efficient for an airline to get all of these services with one vendor under one contract.”

AAR opened a supply chain hub in Brussels last year and the company’s new contract with South African Airways Technical includes a JV to expand MRO services in Africa.

**Airframe Maintenance**

ICFI forecasts 2.8 percent annual growth for airframe MRO, from slightly over $9 billion to almost $12.5 billion, 2015-2025. Part of the reason for this modest growth is the arrival of new-generation aircraft, which will entail fewer hours of heavy maintenance work and longer intervals. Advances in health monitoring technology also will reduce the time aircraft spend in maintenance facilities, said Plucker.

Airframe maintenance has experienced some consolidation, as acquisitions have moved control of some business to Asia, Plucker notes. HAECO (the Hong Kong Aircraft Engineering Co.) acquired TIMCO, for example, and China’s HNA Group acquired SR Technics. Conversely, some U.S. customer wide-bodies and narrow-bodies are returning home for maintenance.

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