CFM MRO ENGINE MARKET 2025: SUPPLY CHAIN AND CAPACITY CHALLENGES IMPACT DEMAND

Airlines' strong demand for new aircraft is driving manufacturers like Airbus and Boeing to increase production targets. This, in turn, boosts the need for engines, including the CFM LEAP series. Freighter Trends learnt that the ongoing supply chain disruptions, including raw material and labor shortages, are affecting engine production rates and delivery schedules. Increased utilization of existing engines necessitates expanded maintenance, repair, and overhaul (MRO) services. Also, stricter environmental regulations are pushing manufacturers to develop more fuel-efficient and lower-emission engines, influencing the design and production of CFM engines. Here are the details .....


Kenneth Johnston

What key factors will influence the CFM engine market in 2025?

Kenneth Johnston, LEAP Programme Manager, Aero Norway - At Aero Norway, we anticipate that several factors will influence the CFM engine market in 2025. Post-pandemic air travel demand remains strong, which will impact fleet utilisation and demand. Airlines are gradually shifting to LEAP-powered aircraft and innovations in MRO processes such as increased use of predictive analytics and automation will play a role in the engine life cycle management.

Additionally, the shortage and high cost of critical components, such as high-pressure blades, will impact the phase-out of older CFM56 engines in favour of more fuel-efficient models. The compatibility of both existing and new CFM engines with SAF will influence airlines' purchasing and operational decisions. Furthermore, geopolitical and economic factors will impact the availability of raw materials and manufacturing capacity, while the strength of the aftermarket will determine the feasibility of economically maintaining older CFM engines.

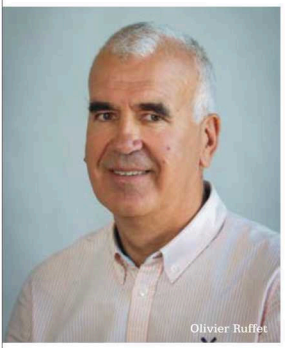
These factors will collectively define the CFM engine market dynamics for 2025, balancing sustainability goals with cost-effective operations. While LEAP engines are the future, CFM56 engines will continue to dominate MRO demand for the near term.

Jean-Louis Forest, Senior Vice President Group Engines Product at Air France Industries KLM Engineering & Maintenance - MRO demand for CFM56 will remain strong, particularly for the CFM56-5B and CFM56-7B engines. Newer aircraft like the 737 MAX and A320neo, using CFM LEAP and PW GTF are facing lead time and region-related durability issues and are working on further maturing. This makes operating CFM56 powered narrow bodies aircraft longer, a potentially attractive option. The MRO market will see high demand for spare parts, shop visits, engine overhauls, particularly for -5B and -7B variants as the B737NG and A320 family classic are the Narrow body working horse for the near future.

The secondary market for used engines and parts will be highly active as airlines optimize costs. This increases pricing of used engines and puts pressure on the availability of used engines and used serviceable material. The ongoing supply chain constraints in parts manufacturing, logistics, and labor shortages, are impacting turnaround times for MRO services,

affecting total cost of operation and the need for spare engines. A robust aftermarket for used CFM56 engines and modules will continue, and the rise of freighter conversions for A320 and 737NG aircraft will extend the demand for CFM56 engines in the near future.

Fernando Comenge, Director of MRO Business Strategy & Supply Chain - Iberia Maintenance - The CFM MRO engine market in 2025 will be shaped primarily by two key factors: supply chain challenges and capacity constraints. The high demand for both engine production and MRO


Olivier Ruffet

services is putting significant pressure on the supply chain, leading to shortages of critical components. Additionally, capacity constraints are impacting both CFM56 and LEAP engine maintenance, as the industry faces increasing demand. At Iberia Maintenance, we are increasing capacity in engine, components, and aircraft maintenance services to support this growing need.

Olivier Ruffet, Airline Sales Director for Europe, Middle East & Africa (EMEA), StandardAero - In terms of the LEAP, we will see a continued ramp-up in utilization as the LEAP-1A and LEAP-1B fleets grow and mature. Safran is now predicting that LEAP flight cycles will overtake CFM56 flight cycles by 2028, with LEAP shop visits predicted to grow from ~1,700 events in 2025 to ~3,100 in 2028 and over 5,000 by 2024. Switching to the CFM56, we expect CFM56-7B/5B utilization and shop visits to remain strong, as GTF groundings and new-gen narrowbody production constraints keep mid-generation aircraft such as the 737-800 in strong demand.

Gert Wagner, President and CEO, MTU Maintenance, Zhuhai - Much like in 2024, we see similar conditions influencing the CFM market, namely that supply chain constraints keep delaying new-generation aircraft deliveries, resulting in the postponed retirement of previous-generation powered aircraft. The situation worsened when the FAA capped the production line capacity for Boeing 737max aircraft, further delaying new deliveries. This increased the pressure on the CFM56, as more engines need to keep flying even longer than previously expected - therefore requiring additional shop visit capacities while there are fewer spare and teardown engines of these mature programs available.

This year there will be a focus on air traffic capacities in major markets, specifically whether they will continue to increase or start stagnating. Should there be stagnation, that would ease the market situation for the CFM56, as aircraft retirements would improve engine availability, including for green-time and spares. In 2024, we already saw a slight cooling, so keeping an eye on the developing trends will prove quite interesting.

How do the LEAP engines contribute to fuel efficiency and sustainability?

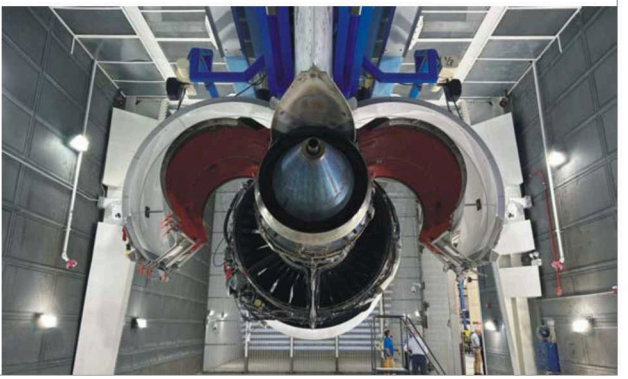
Kenneth Johnston - Due to a larger fan and higher bypass ratio which improves propulsive efficiency, LEAP engines consume up to 15% less fuel than previous-generation CFM56 engines, reducing overall operational costs and carbon emissions.

Jean-Louis Forest - Compared to previous-


Jean-Louis Forest

generation engines (e.g., CFM56), LEAP engines reduce fuel consumption by up to 15-20%, leading to lower operating costs and reduced CO2 emissions. LEAP engines are 100% compatible with SAF (Sustainable Aviation Fuel), which can further reduce lifecycle CO2 emissions by up to 80% when blended with conventional jet fuel.The improved fuel efficiency translates to 15-20% lower CO2 emissions compared to older engines. 50% Lower NOx . The LEAP engine meets the latest ICAO CAEP/8 emissions standards, cutting nitrogen oxide (NOx) emissions by nearly 50%. Also more quiet operation : With advanced acoustic treatments, LEAP engines reduce noise footprints by up to 50%, making them more environmentally friendly for airport communities.

Olivier Ruffet - Per CFM International, the



LEAP engine family provides 15 to 20 percent lower fuel consumption and CO2 emissions, as well as a significant improvement in noise compared to previous generation engines. The LEAP's improved fuel efficiency is in large part due to the use of ceramic matrix composites (CMCs) in its core (including high-pressure turbine shrouds), which allows the engine to operate at higher temperatures, plus the LEAP's high bypass ratio, which optimizes propulsive efficiency.

How do MRO services impact the market demand for CFM56 engines?

Kenneth Johnston - The market demand for CFM56 engines remains strong despite the transition to LEAP engines. At Aero Norway, we have noticed several MRO services that significantly influence market demand, such as cost-effective maintenance and comprehensive MRO services which enable airlines to extend the operational life of the engines and delay fleet transitions to newer models like the LEAP. Additionally, the availability of USM makes overhauls more affordable, sustaining demand for continued CFM56 operations.


Fernando Comenge

The presence of both OEM and third-party MRO providers affects engine maintenance costs and influences decisions on whether to repair or replace engines. The rising costs or shortages of critical components, such as turbine blades and life-limited parts, can impact engine retirement rates and overall demand. As airlines transition to LEAP-powered aircraft, demand for CFM56 MRO services will gradually decline.

Jean-Louis Forest - Large Installed Base: The CFM56-5B (Airbus A320 family) and CFM56-7B (Boeing 737NG), remains one of the most widely used aircraft engines globally. Many aircraft with CFM56 engines are aging, requiring life-extension maintenance, shop visits, and parts replacements. Some Airlines are opting to maintain and overhaul CFM56 engines rather than investing in new LEAP engines, boosting MRO demand. Work-scoping will be key to optimize CFM56 SV costs, consistent with the remaining life of operators fleet. MRO demand for CFM56 engines remains strong due to fleet extensions, aging aircraft, and delays in new aircraft deliveries. However, spare parts shortages, rising costs, and growing competition between OEM and independent MRO providers are key challenges in the market. We expect high demand for MRO services through the late 2020s, with a gradual decline as LEAP-powered aircraft take over.

Olivier Ruffet - We are seeing demand for CFM56-7B MRO remaining strong across the board, including quick-time shop visits (QTSVs), performance restoration shop visits (PRSVs) and module exchanges. With utilization of the global Boeing 737NG fleet remaining strong, as the type remains in service for longer than originally planned (in order to offset the GTF grounding and new-gen narrowbody production constraints), we are seeing an increasing number of operators committing to heavy workscopes (including PRSVs). This trend is in part due to the low level of B737NG retirements in recent years, with the greentime engine pool shrinking as operators run-out the available on-wing life of their engine assets.

Fernando Comenge - As the CFM56 fleet continues to operate and accumulate flight hours, the demand for MRO services is expected to grow significantly, particularly for CFM56-7B engines, where nearly 50% of the fleet has yet to undergo its first shop visit. Airlines require flexible, tailored, and cost-effective MRO solutions to maximize fleet efficiency and extend engine life cycles. At Iberia Maintenance, we bring a customer-centric approach and over 30 years of expertise in CFM engines, offering highly adaptable MRO services that align with the operational needs of airlines. This flexibility, combined with our deep technical know-how and long-standing industry experience, allows us to deliver value-driven solutions to our customers.

Gert Wagner - Due to the factors pointed out in the first question, we expect more demand for CFM56 shop visits, but with the on-going issue of scarce used serviceable material from the few engine retirements, while new-generation engine continue to be subject to delivery delays. Over the last few years, MRO service providers like MTU Maintenance have had to offer shop-visit alternatives such on-site maintenance so that operators to keep flying with the same equipment.

What are the challenges in scaling up MRO

capabilities for new-generation engines like LEAP-1A and LEAP-1B?

Kenneth Johnston - Scaling up MRO capabilities is a strategy that Aero Norway has started preparing for by integrating LEAP services into our capability portfolio. However, this doesn't come without its obstacles as new-generation engines like the LEAP-1A and LEAP-1B present several challenges. These challenges include the need for specialised training and expertise to handle advanced materials such as composites and ceramic matrix composites, which require different maintenance techniques compared to traditional alloys. Additionally, the adoption of new manufacturing technologies, such as 3D-printed components, demands updated inspection and repair methods. Ensuring a steady supply of spare parts and developing cost-effective repair solutions are also critical, as these engines incorporate cutting-edge technologies that may not yet have widespread aftermarket support.

Lastly, vigorous regulatory compliance and certification processes must evolve alongside these advancements to ensure safety and reliability in maintenance operations.


Gert Wagner

Jean-Louis Forest - Air France & KLM Engineering & Maintenance sees the following challenges :

* Mechanics and engineers need specialized training to handle new materials and digital diagnostics.
* Facilities need advanced machining, non-destructive testing (NDT), and digital monitoring tools to handle LEAP components.
* New tooling and test cell upgrades for higher-bypass engines add significant capital expenditure.
* Certification requirements from regulatory bodies (FAA, EASA) and OEM-specific training programs increase the time and cost of workforce development.
* LEAP engines incorporate advanced materials like Ceramic Matrix Composites (CMCs), 3D-printed fuel nozzles, and shrouded turbine blades. These require specialized inspection, repair, and rework techniques, which many MRO providers are still developing.
* Parts availability remains a potential bottleneck due to high demand, OEM-managed spare parts distribution.
* Potential longer leads times for new materials like CMCs and additive-manufactured components impact repair turnaround times.
* LEAP engines rely on big data analytics and predictive maintenance algorithms that MROs must integrate into their workflows.

Fernando Comenge - Scaling up MRO capabilities for next-generation engines like the LEAP-1A and LEAP-1B requires leveraging existing expertise and infrastructure while addressing key challenges such as:

* Industrial setup – Adapting facilities to accommodate LEAP engine overhauls.

Manpower expertise – Training technicians to meet the latest engine technology requirements.

Test cell facilities – Ensuring test benches are fully equipped to handle LEAP engine specifications.

Logistics and supply chain – Managing the timely availability of spare parts and critical components.

As a well-established MRO provider, Iberia Maintenance can leverage existing capabilities to rapidly be able to deliver additional capacity to the new generation engine MRO market. However, a key challenge remains the delivery time of critical OEM-supplied items, such as specialized tooling, which is essential for readiness and efficient service ramp-up.

Olivier Ruffet - The main challenges associated with scaling up MRO capabilities for the LEAP-1A and LEAP-1B have been in terms of tooling and parts, driven both by the scale of the global ramp-up in CFM's LEAP open MRO ecosystem, plus the lingering impact of the Covid-19 pandemic on the supply chain. While the industry does still also face a lingering labor shortage, StandardAero has been able to overcome this by establishing an in-house Aviation Mechanic Training Program, located at its San Antonio site's Training Academy.

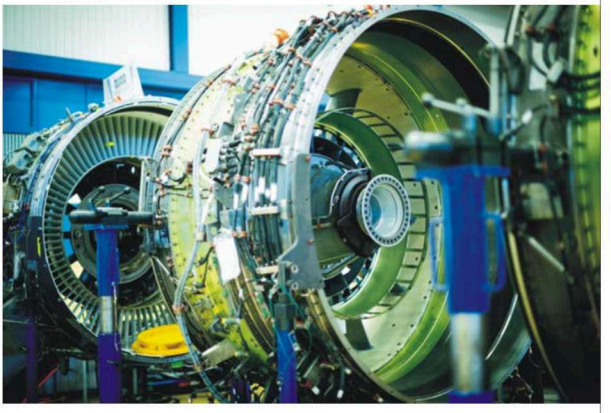
Gert Wagner - As with the implementation of any new engine program, MRO service providers have to acquire the necessary licenses, dedicate existing or build new shop floor space for it, train and certify staff for the work, along with sourcing tooling and spare engine parts which may take months to arrive. Of course, once all that is in place and the quality of work is in accordance with engine OEM specifications, companies have to ramp up production to a point where the investment is paying off and the turnaround times are in tune with the contracts.

What key technological advancements in the LEAP-1B engine enable it to meet the

operational demands of airlines?

Kenneth Johnston - The LEAP-1B engine incorporates advanced composite materials in its fan blades and fan case, significantly reducing weight and enhancing fuel efficiency. These materials also offer exceptional durability, extending the engine's lifespan and lowering maintenance requirements. Designed with improved turbine and compressor aerodynamics, the engine optimises airflow, minimising drag and enhancing overall efficiency. These innovations contribute to better fuel burn rates and superior performance across various altitudes and flight conditions. Another significant innovation is the use of titanium-aluminide alloy in the low-pressure turbine blades. This lightweight, high-temperature-resistant material enhances performance, improves durability, and contributes to reduced emissions and fuel consumption. Its superior strength and corrosion resistance extend the lifespan of the turbine blades, reducing maintenance costs for operators.

Additionally, the incorporation of ceramic matrix composites in low-pressure turbine rings and airfoils further enhances durability and reduces weight. Looking collectively at these developments Aero Norway observes clear benefits for airlines. These advanced materials enable higher operating temperatures, boosting power output and overall engine performance while lowering fuel consumption.



Jean-Louis Forest - Air France & KLM Engineering & Maintenance is maintaining the GENX-1B for over a decade and has built a large knowledge base on these new technologies:

* 3D Woven Carbon-Fiber Composite Fan Blades & Fan Case
* Ceramic Matrix Composites (CMCs) in the High-Pressure Turbine
* High-Bypass Ratio (~9:1)
* Blisk (Blade + Disk) Design in Compressor
* Next-Generation Combustion Technology (Twin-Annular Pre-Mixing Swirler) Combustor
* Prognos ®-Predictive Maintenance & Digital Health Monitoring

Prognos ® for Engines is a predictive maintenance solution developed by AFI KLM E&M to enhance engine health monitoring and optimize airline maintenance operations. It uses big data analytics, AI, and machine learning to anticipate potential failures, allowing airlines to conduct proactive maintenance and reduce unplanned downtime. It includes Predictive Maintenance, Data-Driven Insights, Optimized Maintenance Planning, offers Cost Reduction and Integration with Airline. AFI KLM E&M's Engine Prognos is widely used across different customer airlines fleets, including CFM56, GE90, GEnx, PW4000, Trent, and LEAP engines.

Note: Although not a direct derivative, the LEAP engine does borrow technology from GEnx, including:

* Composite fan blades (though different in size and shape)
* Ceramic Matrix Composites (CMC) for higher efficiency
* Advanced cooling technologies for better fuel efficiency and durability

Olivier Ruffet - The LEAP has been the most successful new product introduction in CFM's 50-year history, with the engine logging over 60 million hours in its first eight years of operation, representing the fastest ramp-up of engine flight hours ever in the industry. The LEAP family also offers industry's highest utilization rates and a departure reliability rate of 99.95%, plus the 15 to 20% lower fuel consumption and CO2 emissions already mentioned. Technological advancements introduced by the LEAP include optimized thermodynamic design, higher bypass and compression ratios, advanced 3-D aerodynamic design – most notably in the engine's striking 3-D woven carbon fiber composite fan blades – and a greater use of lightweight materials, including CMCs.