

THE CFM56-5B AND 7B REMAIN THE MOST POPULAR ENGINES IN THE MARKET

the CFM56-5B and 7B engines maintain their status as some of the most popular engines in the market due to their proven performance, efficiency, and widespread adoption across different aircraft types. In an exclusive to Freighter Trends, the leading professionals in the CFM56 engines anticipate that the CFM56-5B market will mirror the pattern seen with the CFM56-7B, emerging as a highly sought-after asset. Another trend is the Pax-to-Freighter (P2F) conversion of CFM-powered aircraft. This will extend the lifecycle of the current CFM56 fleet and drive continued MRO demand. Here are the details

What is the anticipated market outlook for CFM engines in 2024, considering factors such as global economic conditions and industry trends?

Guillaume Limouzy, Airlines Sales Director for StandardAero Airlines & Fleets -

Demand for CFM56-7B/5B shop visits is expected to remain strong during 2024: as confirmed by IATA, global passenger traffic has now recovered to within 6% of pre-pandemic levels, with full recovery anticipated during 2024. With approximately 45% of CFM56-7B/5Bs yet to undergo their first shop visit, the long-awaited bow wave in CFM56-7B/5B shop visits is expected to peak in 2025, with MRO demand expected to remain strong for the foreseeable future.

Jeremy Colin, Global Business Development & Marketing Manager – Aero Norway -

The demand for overhauls is expected to rise steadily as a result of the increasing number of CFM56 engines (-7B/-5B) reaching maturity and undergoing their initial shop visit. This trend was somewhat delayed by the impact of COVID-19. We anticipate that the CFM56-5B market will mirror the pattern seen with the CFM56-7B, emerging as a highly sought-after

asset. This is attributed to challenges faced by other aircraft types, potentially prompting a contingency plan for the Airbus A320.

Nevertheless, operators, lessors, and owners continue to exercise caution regarding the costs associated with each shop visit. Limited worksopes, such as Fan MM restoration and/or LPT MM restoration, are frequently treated as stand-alone shop visits with a focus on cost, whereas previously they might have been combined with core performance restoration.

At Aero Norway, which is exclusively dedicated to CFM56 engines, we have shifted our attention to CFM56-5B and CFM56-7B engine MRO. Although there is still demand for CFM56-3 maintenance, it is gradually declining. The prices for parts for this engine type are increasing rapidly, however Aero Norway continues to provide support to our customers for this engine type.

Michael Grootenboer, AFI KLM EG-M SVP Group Engines Product -

The global aviation market is undergoing fundamental changes driven by new technologies, the influx of new generation aircraft, worldwide economic effects and of course

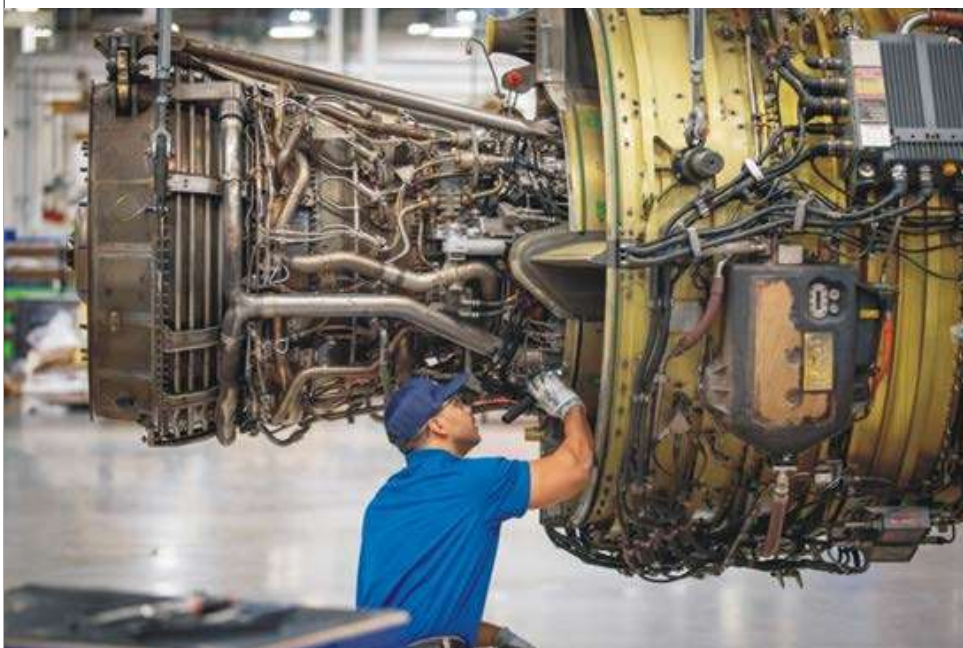


Guillaume Limouzy

decarbonization challenges. In recent times, the industry has seen an increased interest in more tailor made worksopes. Delays in delivery of new aircrafts and supply chain challenges pushes the demand for continued CFM56 engine operation and consequently maintenance. At AFI KLM EG-M we foresee a continued strong demand for CFM56 maintenance in the years to come.

Alistair Forbes, Senior Market Analyst, MTU Maintenance -

The CFM56-5B and 7B remain the most popular engines in the market, with almost 13,000 CFM56-7Bs and nearly 7,000 CFM56-5Bs in service today. For both variants, the peak in terms of active aircraft, flying hours and flight cycles was in 2019, but by 2024 will have nearly recovered. MTU predicts that the -5B/7B active fleet will be only 3 percent smaller than in 2019 and there will be about 53 million engine flying hours this year compared to 2019's 56 million. The reasons for the resurgence in CFM56 operations are two fold: firstly, airlines in all regions of the world are experiencing very strong passenger





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demand and, secondly, the supply of new-built aircraft continues to lag behind, so airlines are keeping their older aircraft flying for longer. In terms of engine shop visits, we think there will be close to 2000 -5B/7B SVs of those in 2024, which will be the highest annual shop visit volume so far.

Julián López Lorite – Commercial Director, Iberia Maintenance - In 2024, despite political and economic uncertainties, we expect travel demand to continue to rise, as shown by our indicators therefore we also expect a growth in the maintenance needs and more shop visits to La Muñoza, where our facilities are located. The lack of engines in the market for exchange and the extended utilisation of the A320 CEOs will drive into additional maintenance requirements.

Arne Stuenkel, Head of Product CFM56-5 Overhaul at Lufthansa Technik - CFM MRO demand has significantly increased and is back to pre COVID levels. In addition, MRO capacity for CFM56 Engines is put under pressure due to manpower shortages in the MRO industry, disruptions in the supply chains and increased demand for new engine type MRO. Furthermore, the technical challenges for the new engine types result in airlines making more and extended use of CFM56 engines, leading to additional MRO demand and postponed engine phase-out.



Michael Grootenboer

Can you elaborate on the observed rise in CFM engine market you experienced in 2023, particularly focusing on the factors that contributed to this trend?

Guillaume Limouzy - StandardAero supports the CFM56-7B from our overhaul locations in Winnipeg, Canada and Dallas-Fort Worth (DFW), USA. In addition to the overall strength of the commercial aviation market, demand for CFM56-7B MRO has also been driven by three other factors: firstly, continuing delays to the 737 MAX program (e.g. with regards to certification of the MAX 7 and MAX 10 variants), and a slower than expected ramp-up in MAX delivery rates, which has led to 737NGs being retained in service for longer than originally planned. Secondly, the popularity of the 737NG as a 'back-up' solution for operators experiencing teething issues with their new-generation single aisle aircraft, most notably in the wake of the powder metal contamination issue affecting GTF powerplants. And, thirdly, the continued displacement of older 737 Classics by the 737NG in the cargo market.

Jeremy Colin - Various factors influence CFM56 engine MRO activity. The two

primary ones include the extent of work required for each engine, encompassing quick-turn services and heavy shop visits with numerous engines reaching maturity. Additionally, the availability of suitable materials for the shop visit such as used serviceable material (USM) versus new parts, also plays a crucial role.

The demand for quick-turn services remains robust. Nevertheless, ensuring a short turnaround time requires MROs to have all parts prepared in advance, as prolonged repair lead times could result in extended turnaround times. In our present scenario, we are prioritising flexibility at Aero Norway, particularly in our heavy shop visits, which constitute our core business.

Procurement of parts and materials has been an ongoing challenge for us all. Despite our proactive approach to strategic planning for materials and induction slots, prevailing conditions at vendors and in the aftermarket could lead to heightened costs and extended lead times. Aero Norway's specialist engine shop, focused solely on CFM56 engines, enables us to offer versatile solutions with remarkable responsiveness. However, some customers are opting for new materials as a solution, considering the potential cost savings compared to used materials, particularly for components like LLPs and HPT blades.

Michael Grootenboer - More demand is seen for tailor-made work scopes in order to extend the service life of current generation fleets for some operators through the phase-in of next generation aircraft or resolution of teething problems for new generation platforms. For other operators, CFM56-powered fleets will



Jeremy Colin

continue to operate for the foreseeable future, driving continued strong demand for full overhauls. Another trend is the Pax-to-Freighter (P2F) conversion of CFM-powered aircraft. This will extend the lifecycle of the current CFM56 fleet and drive continued MRO demand.

Due to supply chain challenges, we see an increase in engine teardown activity at our US based joint venture Bonustech Inc. Used serviceable material continues to be one of the most cost-effective and sustainable ways of sourcing material for engine maintenance. Combined with the extensive CFM56 parts repair capabilities at AFI KLM E&M we are able to mitigate part of the impact of supply chain issues and limit its impact on shop TAT. This way we will continue to efficiently and effectively support the CFM56 market for many years to come.

Alistair Forbes - In 2023, MTU Maintenance performed almost 200



CFM56-5B and -7B shop visits at their facilities in Hannover, Berlin and Zhuhai. This was about two thirds more than were performed in 2022 and reflected strong customer demand. This also compares very favorably with the global CFM56-5B/7B shop visit increase of about 10 percent for 2023 compared to 2022. MTU was able to outperform the market thanks to a high demand driven by customer recovery, in general, and by the Chinese market, in particular. MTU also had sufficient personnel, used serviceable material and capacities at its maintenance and repair facilities to support additional shop visits.

On the demand side, initial shop visits amidst the Covid-19 recovery period tended to come from North American operators followed by European airlines, as those were the first regions to recover. Initially, demand for the CFM56-7B was much higher than for the -5B, as the -7B had a very large US operator base, while the CFM56-5B had more of its operators in the Asia-Pacific region. Workscopes, particularly for the -7B, were larger in 2023 than in 2022, as airlines had needed to conserve cash as much as possible during the pandemic. However, full workscopes can be avoided only for so long and thus by the latter half of 2023, most shop visits were performance restorations.

Julián López Lorite – Iberia Maintenance was affected by two tendencies. The first one was that engines that were going to have a shop visit for redelivery were affected by the extension of the redelivery and therefore, the shop visit did not happen, but the second one was in the other way around, customer that did not have shop visit expected, leased A320 CEOs with maintenance needs. In general, we reached the number of inductions we had in 2019.

For our Engine Shop, the CFM56 represents one-third of the total number of inducted engines. Apart from the CFM56-5B, where Iberia Maintenance cements its position as the preferred provider for all IAG airlines using this type of engine, services are provided to various CFM56-7B operators and asset managers. In 2022, Iberia Maintenance inked an agreement with RwandAir for the maintenance and repair of its 7B & 7BE engines, powering the airline's Boeing 737 fleet.

Arne Stuenkel - We observed strong growth in MRO demand for CFM engines in 2023 due to a significant increase in air traffic (due to lifted COVID rules) and postponed (Engine-)MRO events during COVID crisis in combination with industry-wide manpower and material shortages leading to scarce capacities.



Alistair Forbes

What are the expectations for the long-term stability and growth potential of the CFM56 market, considering the observed trends and forecasts?

Guillaume Limouzy - Based on the size of the in-service Boeing 737NG and A320ceo fleet, which currently stands at approximately 10,000 aircraft, the growth rates forecast for the commercial aviation market over the next two decades, and the likelihood that a significant portion of 737NGs and A320ceos will enjoy extended service with secondary and tertiary operators, we expected the CFM56-7B/5B MRO market to remain strong for many years to come.

Michael Grootenboer - It will take some time before the industry will overcome current supply chain challenges. Delays in new aircraft deliveries, teething problems of new platforms and high demand for new parts manufacturing will continue to impact the industry for the coming years. This will drive the need for life extension of

the CFM56 fleet and consequently the continued need for maintenance. Module swaps, tailor made work scopes, repair and used serviceable material access will be key to support AFI KLM EGM customers to overcome these issues.

Alistair Forbes - MTU predicts that the CFM56-5B/7B global fleet will stabilize between 2024 and 2026 with about 36 million engine cycles flown in each of those years. There will then be a gradual reduction in global fleet activity, as more aircraft get replaced by 737MAX and A320/321neos. Even as far out as 2035, the active fleet will be about 65 percent of 2023's fleet.

However, the shape of shop visit demand is quite different. Unlike flying, which peaked in 2019, shop visits will not peak until 2026 for the -7B and 2027 for the -5B. Most of the latest generation of -5Bs (Performance Improvement Package or PIP) and -7Bs (Evolution or BEs) have not undergone their first shop visit, so there will be plenty of demand to keep MRO shops busy for a long while yet.

It is important to understand that within both the -5B and -7B families there are three distinct engine generations: the original Single Annular Combustor (SAC) generation, the Tech Insertion (TI) generation and the PIP/BE mentioned earlier. There can often be greater parts commonality between, for instance, a CFM56-5B PIP and a CFM56-7BE than there is between -7BE and a -7B TI. The SAC generation of engines represent about 25 percent of the current fleet, but they are about 90 percent of the engines being retired. Shop visit demand for the SAC engines is lower than for the TI generation, which also represent about 25 percent of the fleet but only 7-8 percent of retired

engines. The BE generation are the youngest 50 percent of the fleet and they are coming up to the first or second shop visit, but there is very little used serviceable material for these engines, as hardly any BE-powered aircraft have retired so far.

Julián López Lorite – The CFM market will be definitely affected by the Leap/GTF problems. Airlines will either extend the CEO aircraft leases or lease CEO aircraft to cover those NEOs on ground and therefore, the maintenance needs will change and the shop visit requirements will be extended in the long term.

Arne Stuenkel - The CFM56 engines have reached the absolute peak in active engines and MRO demand. Moreover, the engines have proved to be very reliable with few significant technical developments to be expected. In contrast, the technical problems with the new engine types prolong the usage of CFM56 powered aircraft and spare engines. The increasing market for Pax-to-Freighter conversion allows for a second flight of CFM56 engines with specific flight profiles and customized MRO demand.

What are the global market dynamics significantly impacting the trends surrounding CFM56 engines in 2024.

Guillaume Limouzy - We expect trends to remain similar to those experienced in 2023,

Michael Grootenboer - Given the current global constraint on both shop capacity and the supply chain for new parts, the used serviceable materials (USM) market provides a key way to reduce our reliance on the supply of new parts. To support our



access to USM, we have a joint venture in the US, Bonustech Inc., which specializes in the teardown of end-of-life engines and the extraction of serviceable parts.

Prognos4Engine predictive maintenance, accurate workscooping through highly competent engineering, extensive repair capabilities and access to used serviceable material ensures a proper anticipation of new part needs and therefore timely part availability, leading to TAT optimization and material cost minimization.

Capacity shortages in worldwide shops will continue in the near term, making it important for customers to confirm their needs in a timely fashion to ensure slot access.

Alistair Forbes - The two main factors are: strong passenger demand in all regions and fewer (and later) new aircraft deliveries than airlines planned, and in turn, high reliability of aircraft, such as those powered by the -5B and -7B. The strength of the passenger market combined with a less buoyant cargo market is also making conversion of 737-800s and A321s into freighters a less attractive proposition than it seemed a couple of years ago. So there will probably be fewer conversions in the next few years than was thought back in 2021 or 2022.

However, the 737-800 and A321 are the natural replacements for 737-400 and 757 freighters, respectively, and we can expect to still see a steady flow of conversions for -5B and -7B aircraft over the next decade. With all of this demand for -5Bs and -7Bs, it should come as no surprise that relatively few aircraft will be retired in the next few years. Those aircraft that have been retired have tended to be the smaller variants, such as the 737-600 and -700 or the A318 and A319, as airlines have shifted their preference towards larger aircraft. This has meant that most of the used serviceable material (USM) needed to support cost-effective shop visits has come from the engines from these retired smaller variants. However, the feedstock of these aircraft models is running out and this is going to put a squeeze on USM availability in the next few years until enough new LEAP and PW1100G-powered deliveries enable significant numbers of 737-800 and A320s to retire.

The complexity of the -5B and -7B market is one that needs a real engine expert to deal with and with



our extensive MRO, in-house repairs, on-site services teams, leasing and asset trading capabilities, it is a market that MTU is well placed to serve for many years to come.

Julián López Lorite – Same as the previous years since the COVID-19 pandemic, in 2024 the growth trend will be affected by supply chain issues and the changes in the redelivery conditions affecting the CFM/A320 CEOs.

Arne Stuenkel - Reduced MRO capacity for current engine options meet a stabilized and high shop visit demand. The OEM focus shifts more and more towards new engine types while MRO shops must balance capacity increase and product mix. Lufthansa Technik is well positioned to supply operators with decades of engineering know how, vast repair capacities and capabilities as well as excellent used serviceable material availability. In addition, Lufthansa Technik's Fleet Life Cycle Management products ensure optimized shop visit strategies and cost per flight hour especially for airlines' phase-out scenarios thus reducing the need for major engine overhaul shop visits.

What Impact do you see on MRO Services on Market Demand for CFM56 Engines.

Guillaume Limouzy - Overall, we expect to see demand for CFM56-7B/5B MRO

serviceable material (USM) to help minimize event costs will also remain a popular option for some operators, and we will continue to support such demand through our dedicated PTS Aviation asset management subsidiary.

Jeremy Colin - The steady growth potential of the CFM56 market is impacted by the demand for an increasing number of shop visits and the rise in material costs.

As mentioned previously engine shortage and pricing continue to be a challenge. With some CFM56-7B engines becoming rare assets in the market, their purchase prices have risen, impacting overall maintenance costs. To mitigate this issue, Aero Norway actively explores cost-effective options, such as our Engine 'BUY and SELL' programme, to secure required assets at competitive prices and offer flexible solutions to customers. In the last two years the increase of the Catalogue List Price of parts from the manufacturer has been a major challenge. All material, but especially high value parts such as Life Limited Parts (LLPs), have been increasing by double digits every year.

Lead time and TAT are other factors. Customers often demand faster turnaround times for engine overhauls to minimise aircraft downtime. Efforts are made to reduce turnaround time (TAT) by



Arne Stuenkel

Norway has worked ahead by anticipating these delays and making advanced arrangements to ensure timely availability of required parts, reducing the impact on production schedules.

Customers frequently have unique requirements and workscopes for their CFM56 engines. Aero Norway addresses this challenge by utilising our split production capabilities and in-house expertise to customise and tailor workscopes for individually, ensuring customers' specific needs are met precisely and efficiently.

Michael Grootenboer - More tailored work scoping to comply with the needs of AFI KLM EGM customers in order to manage the fleet towards renewal. More demand for repairs and Used Serviceable Material, which the AFI KLM EGM network is able to provide through our repair capabilities and network, such as Airfoils Advanced Solutions, our Joint venture with Safran on HPC Blades and Vanes. We also have a strong cooperation with the OEM in order to continue to develop and industrialize more repairs for the CFM56 to continue to manage lifecycle cost.

Julián López Lorite – We expect to have a growth in maintenance requirements in 2024 with more shop visits than in 2023.

Arne Stuenkel - The above mentioned factors lead to increasing demands for Mobile Engine Services (MES) and single module overhauls to improve and secure engine availability for operation before time-intensive overhaul shop visits have to be scheduled.



services remain strong. Lead times for major shop visits may encourage some operators to make use of lighter shop visits to keep their fleets flying, and StandardAero has responded to this trend by introducing a range of service center capabilities at our DFW International Airport facility. The incorporation of used

preparing materials in advance before the engine arrives for repair. However, the reality of long lead items within the supply chain can still impact the engine overhaul process. Some specific engine components, such as fan blades, have had longer lead times from single-source repair vendors, impacting planned shop visits. Aero