



Aero Norway ramped up heavy engine overhauls in March.
Photo: Aero Norway

CFM56: Engine **maintenance** ramps up while material costs rise

Keith Mwanalushi examines the post-pandemic recovery of the popular CFM56 platform, the trends in costs and supply for engine materials and the key considerations for upgrading to a full shop visit.

MROs are seeing demand for CFM56 maintenance progressively return following the COVID downturn. Since the start of the year, Aero Norway saw much more shop visits for heavy engine overhauls, and as such, ramped up production in March. Neil Russell, Chief Operating Officer says these are all -5 and -7 heavy slots with an increased production rate compared to a year ago when they mostly had -3 heavy engines with less production rate.

"This has shown us a good start to recovery but still tentative in the market." Aero Norway is seeing fewer builds to put new, full life LLPs into the engines. Russell says several operators and lessors are looking for half-life (or less) engines

or modules. "This demand covers all models and all configurations; this leads to different costs and supply scenarios." For example, he indicates that currently, there are issues to find some used LLPs on the -3 engines, there is availability for non-tech and tech insertion engines on the -5B/-7B, at the same time there are less available used -7BE/5B PIP materials to meet half-life demands.

Much of the recovery is coming from the U.S and Europe where MROs are increasing their activity and flying schedules. "However, there is still limited activity from Asia due to the lack of aircraft utilisation and still lack of widespread maintenance plan visibility due to the prolonged COVID recovery," observes Simon Walker, VP Asset



Neil Russell, COO at Aero Norway Photo: Siv Sivertsen

Management at AerFin.

In general, however, MROs and aftermarket specialists are seeing a significant increase in USM demand as flying schedules return and airlines have the confidence to prepare long-term maintenance events for their fleets. "Additionally, as operators bring aircraft out of long-term storage, we are seeing instances where engines are failing inspections due to corrosion and therefore heading into shop for overhaul," states Walker.

As the appetite grows for teardown assets so does the purchasing price,

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creating an increasingly competitive purchasing environment, Walker indicates. "However, that being said, we are seeing that the pricing for USM and tech insertion material is steadily returning to pre-pandemic levels, driven by both demand and the delays in the global repair network."

At AerFin, they have noticed significant increases in the cost to repair material, especially when compared against the catalogue prices – "It is believed that OEM material shortages and price increases are driving this up-turn."

Meanwhile, MROs are experiencing extensive turn-around-times (TAT) on parts sent for repair, with many repairs exceeding 75 days on average. AerFin is working with a wide network of vendors to try and mitigate these turn-around times for operators, but it is undoubtedly a trend felt across the industry.

At Magnetic MRO, they see the market slowly recovering on CFM56-7B and -5B engines. The -7B is recovering faster due to higher utilisation on the 737NG family and the -5B engine on A320 family is still quite depressed, according to Alexey Ivanov, Magnetic Engines Sales Director.

"The number of overhauls and heavy repairs are still less than before COVID, says Ivanov. "The number of airlines and asset owners are still choosing the option of using green time engines or partial



Alexey Ivanov, Magnetic Engines Sales Director



Simon Walker VP Asset Management at AerFin

hospital repairs and modules change instead of overhauls. Many engines are going to disassembly and it feeds the stock of spare serviceable modules which supports the concept of modular changes instead of repair of original engines."

For example, Ivanov explains that there is absolutely no sense to perform the repair of fan module or LPT module on the engine unless the defect is minor there – "If a defect is major or LLPs require replacement it is cheaper and way faster to install spare serviceable module instead of overhauling original modules."

Ivanov points to some that were mostly neglecting hospital repairs or modular changes – "airlines and engine owners are more often considering hospital repairs to return the engine to service for another year or two or replace the affected module with expired LLPs with the module coming from the donor engine or from teardown. It allows you to return the engine to service much quicker and with much lower cost."

Magnetic MRO has observed the OEMs

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Simon Walker, AerFin

following the market to support hospital repairs. "CFMI has recently introduced Special Procedure 20 in addition to Special Procedure 10 which makes certain hospital repairs even easier as it is possible to apply AMM limits instead of EMM limits more often for hospital repairs.



Russ Shelton, President, Engine Strategy Group

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Russ Shelton, GA Telesis

“As the main focus of Magnetic Engines is mostly hospital repairs and modular changes, we welcome such change considering we are a small engine shop, we do not perform full repairs and overhauls,” Ivanov adds.

Regarding access to materials to support CFM56 maintenance programmes Russ Shelton, President, Engine Strategy Group at GA Telesis reckons the demand is high, the supply is unpredictable, and the costs are escalating – “Repair vendors, in particular, are struggling. Turn times are multiples of what they should be for specific parts, and the availability of substitute parts is limited. These factors have created engine TATs that are way beyond acceptable,” he notes.

As the CFM56 engine matures, Shelton believes engine builds need to be



John McKirdy – SVP, Technical Services, Kellstrom Aerospace and Vortex Aviation.



The market is slowly recovering on CFM56-7B platform.

Photo: GA Telesis

targeted to achieve return conditions for leased aircraft and end of life for all others – “absolutely nothing more,” he stresses.

John McKirdy, SVP Technical Services at Kellstrom Aerospace / Vortex Aviation feels the recovery is mixed. The Group sees a robust level of activity on field service requirements and hospital shop visits across the board on the CFM56 models. “Demand is high for services that save engines in the field as well as surgical strike light visit management driving both the length of time the engine is on the ground and the cost of the maintenance events itself downward.”

McKirdy says operators are very demanding of Vortex Aviation to manage the quality requirements while effectively outlining cost saving strategies to produce an engine that meets the mission of its next service interval. “Although the Ukraine – Russia crisis and the recent spike in the cost of fuel have added an extra element of complexity to the immediate forecasting of the demand for maintenance, the clear signals from the market are the concerns over cost management for the lift each asset owner is responsible to fulfil. All the CFM56 engine models have robust hospital shop and field service demand at this time

keeping our four facilities highly engaged with our customers.”

At this time, in terms of materials, the CFM56 model appears to be behaving in a stable fashion relative to some other engine types (namely the CF6-80) in that price and availability have not dramatically changed, McKirdy reckons. He says for the quick-turn field service and hospital shop visit maintenance that Vortex Aviation performs, USM is available at reasonable fair market value and new materials such as expendables and consumables are also readily available and fairly priced given today's market conditions. “The focus for MRO supply chain is on parts that are sent for repair. In most cases, the TAT for repair orders have essentially doubled [from 25 to 50 days], causing shops like Vortex to be very diligent on the front end with suppliers in determining such things as real TAT versus marketing TAT, and collaborating with suppliers that have available exchanges. Further, where appropriate, Vortex Aviation has secured some of our own rotatable materials to support our CFM56 maintenance lines and we work with our customers to secure customer furnished parts that can help drive down TAT and cost.”



Anca Mihalache, VP Engine Trading & Leasing at APOC

Anca Mihalache, VP Engine Trading and Leasing at APOC Aviation adds that materials are currently available in the market and there are offers from buyers and sellers alike – “but we are also seeing some distributors and MROs stockpiling parts to ensure their accessibility in the near future.”

Speaking on engine maturity and how operators can best optimise the engine's life, APOC offers green time leases, as Mihalache explains, this means that operators can use APOC's engines for a monthly fee, until they become unserviceable, or they reach their life limit. “This is a very attractive proposition for some operators as it allows them to delay shop visits of their own engines until they are in a stronger position as they continue their post-pandemic recovery.”

Identifying defects and the key considerations for upgrading to a full shop visit

One of the main considerations for evaluating when an engine needs a full shop visit is whether it has reached its first overhaul time or not. “Other factors that also need to be considered are the availability of materials on the market, the specific engine shop that is working on the asset and of course the value or financial state of the engine in question,” Mihalache highlights.

Russell from Aero Norway feels it is entirely dependent on what the significant defect is – “for the CFM56 engine, the modular design makes it easier to rectify

significant defects while also reducing the need for a full shop visit.” He points out that SP10 and SP20 also allows more flexibility to fix those defects, without impacting the required maintenance. “There is also the cost impact that is a consideration when the thought of a full shop visit may be there if a significant defect is found, but this depends on what the operator or owner of the engine wants to do with the engine next; SP10 and SP20 can limit the cost, swapping modules can reduce this too by getting some value out of remaining modules.”

Ivanov from Magnetic argues that there is no generic approach as every engine is unique and every engine owner has different plans for his asset. “Usually there are certain plans over the engine lifecycle. If the defect is so called expected and discovered at the segment of engine life when the engine is ready for repair then the owner makes the decision if it is economical to invest cash into the engine repair and operate it further or if it is more efficient to tear it down and sell the parts. Or perhaps the whole engine can be sold to liquidators if the owner does not have the resources to spend on teardown projects.”

More complicated scenarios unfold when an unplanned defect is discovered in the middle of the engine life between repairs and that defect leads to serious engine repair. Ivanov says if the defect is minor, and repair is not costly compared to future cash flow from the engine operation then the

engine just goes to minor repair and returns to service. An example is when you have a CFM56-7B engine with good life remaining and find defects on the HPC blades which leads to a top case repair or VSV bushings replacement. “The owner will just perform the repair and return the engine back to service. It will decrease profitability on the whole engine lifecycle but does not change it drastically.” Another example is the replacement of LPT stg 1 NGVs on -7B or -5B engines.

“This is always a risk,” comments Shelton from GA Telesis. He says fortunately, the pre-induction workscope does a fairly good job of mitigating this potential and the primary consideration is the cost. “This might drive the choice between a teardown and a heavier ESV in a stable market. Today, customers are more likely to opt for the ESV due to a general lack of alternatives for this engine. Operators with larger fleets have more options since the scenario plays out within their overall fleet plan,” says Shelton.

John McKirdy concludes and says the decision to upgrade to a full shop visit mostly relies on the assessment of the value of that asset and revenue generating possibilities after the cost of the upgraded maintenance event, versus the value of that asset if it were to be torn down and sold for parts. He notes that considerations for the availability and utilisation of USM and, or customer furnished parts reduce cost and often reduce TAT.



Shop visits for the CFM56 are on the up following the COVID downturn.

Photo: Aero Norway