

**Repairing components and ensuring stocks are at appropriate levels is a balancing act, as Henry Canaday reports.**

Even excluding engine parts, components represent about a quarter of aircraft maintenance spending. And smart component maintenance has several critical dimensions. There is cost, of course, including the cost of holding inventory and managing repairs and restocking. Timing is crucial, as delays boost inventory needs and can disrupt schedules. Finally, the quality of repairs and spares counts as well, as these affect reliability and long-term value.

The best vendors pay attention to all three dimensions, as their airline customers must as well.

GE Aviation's ultimate objective in engine and engine-component support is to drive total ownership costs down over the entire life of engines, explains Scott Fentress, who manages new repairs. That means reducing shop costs and turnaround times, maximizing time on wing and decreasing specific fuel consumption – anything that improves cost or performance.

Smart repairs are important, as repairs cost 85% to 95% less than new parts. GE and its joint venture, CFM International, thus develop hundreds of new repairs each year. As a result, the scrap rate – the portion of parts discarded – in shop visits is continually declining.

GE has now moved beyond first-generation additive repairs to the second generation, which includes cold-metal transfer, cold spray and laser cladding. By using less heat than traditional welding, these techniques produce less cracking and distortion of parts, in turn lowering scrap rates. New repairs have been used, for example, on rotating seal teeth and thin panels in engine flow paths.

Other firms also use cold spray, but GE has patented a new technique that uses a gas as the delivery medium. Each repair



Inspection work at AJW Technique.

# Smart component support

technique must be tested and perfected for each material it is used on.

GE also intensely uses digital tools, first for analytics to monitor engines and foresee potential issues. Turning unplanned maintenance into planned events has a huge impact in reducing not only maintenance cost but operating losses.

Digital tools increasingly manage shop visits to deliver engines both on time and more promptly. For example, tracking components that have been outsourced and synchronising their return to the overhaul line brings big gains in efficiency and speed. That increases asset utilisation, a crucial

factor in cost of ownership. GE is deploying digital shop tools in its own facilities first, and will roll them out to partner shops as well.

One result is that GE customers have seen shorter turn times over the last 18 months. Fentress says the firm will redouble its efforts to further trim shop time in the coming years.

Another money saver is increasing exploitation of used serviceable materials as an engine model ages. These materials can beat new part prices by 40% or more. GE is very active in exploiting this option, with GE Materials procuring assets to disassemble for spares. >>>





Last year GE introduced TrueChoice, which includes flight-hour, overhaul, material and, most recently, transition programmes. These especially suit engines approaching the end of normal life. The aim is to offer an operator the best option, given its financial position and planning horizon. For example, a very economical repair package might be best for an engine that will be flown only for a couple of years until new engines come into a fleet.

The aim of AJW's Montreal repair station, AJW Technique, is also to reduce the total cost of ownership in component support, notes director of sales Josh Goring. Through quality and innovation, the Canadian shop is good enough at that to provide many of the repairs for one of the largest low-fare airlines (LFAs) in the world.

Any repair or replacement can be expensive, so AJW Technique first looks for alternatives. AJW Group is one of the largest providers of aircraft components, allowing AJW Technique to benefit from the purchase of major assemblies on the aftermarket, which can then be broken down into subassemblies of used serviceable materials. "That's a 60% to 70% saving

versus OEM parts," Goring notes. "Each component is inducted and certified after stringent quality inspection. We have a very good line of sight on where to get inventory and how."

AJW Technique also uses data analytics on the 1,200 units it processes each month, figuring out which piece parts fail, and when and why. That enables the shop to replace some parts before they break, saving future repairs and keeping components flying longer.

Developing and certifying new repairs takes a long time in aviation. AJW Technique uses its Design Approval Organization to innovate here, but also innovates in service, increasing on-wing time or delivering repaired parts faster. The shop now repairs parts in 80% of ATA chapters, including avionic, pneumatic, hydraulic, fuel, electric generation, galley and safety components.

AJW Technique undertakes a third of the \$200 million in annual maintenance for which its parent company is responsible, but must compete for all the work it does. The company began working with about 10,000 unique parts but now focuses on 5,000 for which it can provide the most competitive service. Parent AJW Group

**GE Aviation's TrueChoice programme includes coverage of all CFM engines.**

tailors a variety of terms, including flight-hour, time-and-materials and fixed-price, to each airline's specific needs. With 1,300 aircraft under flight-hour agreements, keeping repaired parts on wing longer is critical to both AJW and its repair providers.

Also critical is turnaround time. Goring says this includes much more than shop time. For example, AJW Technique tries to shed unnecessary steps in booking and transport. It builds shelf inventories of modules that fail frequently, so it can swap out these modules quickly, rather than wait for incoming assemblies to be repaired. Systems monitor test-equipment use, so technicians can avoid waiting lines and move onto other units.

#### OFFERING OPTIONS

"Some repair shops persuade airlines to invest in repairs and save units at any cost," observes Julius Bogusevičius, head of component and material sales at FL Technics. Full-scope MROs like FL provide not only repairs, but parts and other services. They offer several options for either short- or long-term purposes.

Repair turn-times depend on technology, inventory, staff and processes. Poor processes or planning will slow things down. FL Technics focuses on process control with continuous reporting on progress. "This allows us to quickly identify bottlenecks and risks to agreed turn-times," Bogusevičius says. The MRO responds by deploying additional resources or finding alternatives.

Timely delivery of spares requires daily monitoring of inventory pools to ensure the parts necessary for planned work scopes, plus ad hoc needs. To handle atypical repairs or unplanned replacements during overhauls, FL Technics maintains 24/7 AOG support and deliveries from over 500 suppliers.

For both regional and low-fare airlines, the company offers comprehensive flight-hour programmes, delivering parts on strict deadlines. Carriers get refunds if FL Technics' suppliers are tardy.



To minimize risks, FL Technics offers consignment pools at main or secondary bases of components most frequently needed. Airlines pay only when they draw from a pool.

AAR develops internal technologies and increasingly uses external technologies to improve salvage rates for many components, says Kevin Connelly, general manager of component repair in New York. Other changes in work also improve salvage rates. Previously, technicians were trained on specific components. Now they apply skills to specific processes.

AAR is also reducing process variation. Material Evaluation Cells of senior technicians, metallurgists and engineers determine whether parts are within manual requirements or need replacing. This has reduced scrappage by 7% over a period of just three months.

### REQUIRED PRIORITIES

For repairs, AAR now focuses on on-time, not just turn-time. By concentrating on communication and customer needs, it delivers 97% of units based on required priority. Connelly credits “improved forecasting, targeting strategic components, e-commerce data portals and better understanding customer needs”.

The president of AAR’s integrated supply chain solutions, Deepak Sharma, says global hubs minimise delivery distance and time. The company exploits partnerships with OEMs and trusted vendors for procurement and exchanges. Predictive maintenance software and experience in component repair enable AAR to anticipate repair needs.

Sharma says regionals and LFAs typically choose nose-to-tail management of parts and repairs. CommutAir recently chose flight-hour support on rotatables for its Embraer ERJ 145s. Integrated supply-chain agreements also support Volotea, Enter Air, fastjet and flydubai; over 1,100 aircraft in all. Sharma promises more deals are coming.

In addition to its own warehouses and shops, AAR can co-locate in customer

facilities. It can repair components or manage repairs by other vendors, offering more services than most vendors.

BAE Systems recently launched asset-management offers such as pooling, exchanges and loans of its products. Aftermarket manager Brent Myers says offers include avionics, flight-deck and cabin systems on both Boeing 737NGs and MAXs. “New programmes will transform our aftermarket services into a more tailored experience for customers, guaranteeing availability of spares and adding additional options for managing assets.”

Under pooling, airlines pay for access to an allotment of spare parts for their supply chain. “We simply backfill when the airline pulls a part for use on an aircraft,” Myers explains. BAE will offer pools for one airline or for a group of airlines in the same region. The pool eliminates the need for part inventory at airline facilities.

BAE’s exchanges allow airlines to send parts to the OEM and receive a new or overhauled part within a prompt turnaround time. No long-term agreement is required for an exchange, and exchanges are

now available in Singapore, France, Dubai, Shanghai, and Indiana in the US.

Part loans can provide a money-saving, short-term solution if an airline only requires a part for limited time. Loans could assist small, start-up airlines with the spares needed to maintain operations and keep their fleets flying.

In addition to reducing inventory and guaranteeing costs, the programmes offer airlines OEM expertise in design and reliability. For example, BAE pools will include new OEM parts on NGs and MAXs with the latest configurations. Service levels will be based on customer expectations.

Myers says BAE’s asset-management programmes can be charged according to flight hours or monthly fees. The firm is now discussing its proposals with several airlines. “This is a brand-new approach for BAE Systems, so it will provide growth in the aftermarket.”

Logistics manager Kaarle Karp says Magnetic MRO must frequently meet tight deadlines for delivering components. Most MROs now try to hold fewer spares. But if leaner stocks combine with inadequate

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consignments; planning; co-operation with Continuing Airworthiness Management Organisations; and usage statistics, meeting tight deadlines is tough.

Magnetic follows certain principles to minimise the time required to deliver components. First, planning predicts demand for parts and ensures all required materials are ordered before jobs start. Good planning takes into account aircraft type, age and region and non-routine cards opened during previous C-checks.

Next, first-in, first-out methods reduce risk of components aging. "Dead stock brings no benefit to clients or your business," Karp stresses. Stocks can age if demand is low and the price drops, so they are not sold off. Magnetic tries to get any

parts held for a year or more into production or into the market. "Everything over three years old is dead stock," Karp says. "Materials with shelf life, mainly chemicals, can be the biggest headache."

### PUNCTUAL PARTNERS

Magnetic also has a strong network of forwarders. "Do not keep all eggs in one basket," Karp advises. "Every forwarding company has its own strengths and weaknesses." He constantly reminds forwarders of the importance of punctuality in deliveries and consequences of tardiness.

Magnetic pays close attention to customs. "Find out the special solutions local customs and cargo terminals can offer," Karp urges. Simplified customs procedures

may enable quick access to spares, with customs clearance done several days later. "Another solution could be to have your own customs warehouse," he adds.

Consignment stocks cover fast-moving spares. Small companies near each other or at the same airport can share inventories. In addition, Magnetic MRO tracks and traces its urgent incoming shipments. It uses charter flights whenever justified by the value of expediting aircraft repairs. Finally, the MRO plans to exploit new 3D printing techniques to make some parts rapidly, avoiding lags in part deliveries.

The technologies to repair rather than replace continue to advance. Pairing with the right package is where airlines can ensure that any downtime is minimised. ■

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