



GE Engine Services

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Air China upgrade gets to the core

Air China has ordered five CFM56-3 core upgrade kits from CFM International for incorporation into its fleet starting this year. The upgrade will nearly double the on-wing life of selected CFM56-3 engines for the airline.

Aviation industry appraiser AVITAS determined that adding CFM's upgrade improves the engine's residual value by up to \$1.2 million.

Bob Barton, general manager of Upgrade Sales for CFM, commented, "Air China is a long-time customer, and we're happy to have the opportunity to put that relationship on a new level. They performed a very extensive technical and financial evaluation, and found the value story compelling, because the average payback period was less than two years."

Using its integrated engine system approach, CFM developed a kit that infuses the latest, proven technologies into the successful CFM56-3 engine. An advanced, higher efficiency 3D aerodynamic design technology improves EGT margin by 15°C and reduces fuel consumption, for a savings of up to 1.1 percent—validated during the flight test program.

Operators benefit from up to a 50 percent reduction in hot section material costs for repair and replacement of HPT nozzles, blades, and shrouds. They also realize an average time-on-wing increase of up to 2,000 cycles. Both improvements result in a reduction in total cost of ownership of up to 30 percent (based on fleet averages).



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CFM International is a joint company of Snecma Moteurs and General Electric Company. GE Engine Services sells upgrade kits to certain CFM customers on behalf of CFM.

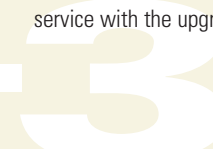
FAA certifies upgrade package

The U.S. Federal Aviation Administration certified the CFM56-3 core upgrade in September. CFM's first kits were delivered for installation in launch customer Southwest Airlines' engines. The carrier began revenue service with the upgraded engines in the fourth quarter.

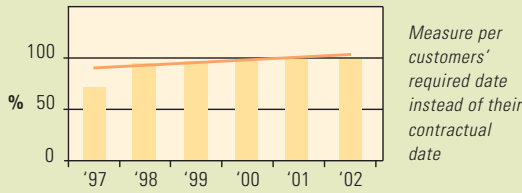
TECH TIPS

Now Available

Unison Industries, Inc., a wholly owned subsidiary of GE Engine Services (GEES), is now making its quarterly newsletter, *Tech Tips*, available to GEES customers. We've enclosed the latest copy, so you can decide whether you want to receive it. We've also included the first in a series of articles about Unison on page 2.



GEASO Service Level



Customer: an important component in repair shop's success

GE's Hungary and Singapore component repair shops* are now delivering a 99 percent service level (percent of time the turnaround time goal—contractual or customer-required—is met) to customers, thanks to several shop flow improvements.

When GE opened its Hungary shop in 2000, challenges included improving performance and service level and eliminating variance. Starting from a service level of about 60 percent, with a large variation, GE integrated all functions to ensure that daily actions were driven by customer requirements. Specific initiatives included making sure data tracking

focused on speed, quality, and flexibility, conducting monthly reviews with customers to understand how they saw shop performance, and training personnel to handle records in real-time, improving workflow and accuracy.

Similarly, the Singapore shop (GEASO) raised its service level from about 75 percent in 1997 to 99.7 percent in 2002. Singapore reorganized its process, putting production control into the customer service function so the voice of the customer was represented in the shop. Additionally, GEASO designated four schedulers to work closely with the shop, and designed a structure to quickly alert them if the process was falling behind.

In 1999, GEASO changed its measurement to “customer required date,” which may be faster than the contractually required date.

One customer from AirLiance Materials commented on the results of GE's process improvements:

“I would like to take this time to thank you for your help in expediting this order. Your assistance resulted in the on-time delivery of a substantial purchase. I look forward to working with you in the future.”

*GE Engine Services Division, GE Hungary Rt. (FAA RS# G69Y912Y) and GE Aviation Service Operation Pte. Ltd. (FAA RS# FS4Y191M)

This is the first in a series of articles about the capabilities of Unison Industries.



Unison harnesses power

Unison is at the forefront in the design and production of aerospace harnesses—high-quality wire bundles that route electrical signals and power around turbine engines and airframes. The proliferation of FADEC-controlled engines has increased the need for reliable, high-temperature wiring harnesses. Unison produces all three types in use today:

- **Open bundle:** Wires are attached to connectors and tied into bundles.
- **Closed bundle:** Wire bundles are wrapped with an outer braided layer of material.
- **Overmold:** This closed bundle type harness has wire bundles, connectors, and backshells covered with a material that keeps moisture out.

If you already receive *Service Solutions* and also want *TechTips*
 OR if you now receive *Tech Tips* and also want *Service Solutions*,
 please contact us at (513) 772-9288 or wparrott@eos.net.

GE keeps Farnair in the air

By exchanging two CF6-50C2 engines owned by Farnair Europe for one serviceable engine and cash, GE Aviation Materials (GEAM) saved the Rotterdam, Holland-based carrier more than \$1.5 million. The airline operated three CF6-50C2-powered A300B4 aircraft on short-haul freight service within Europe. It was able to keep all three of its aircraft generating revenue by utilizing the GEAM engine, along with a spare engine of its own, to replace two engines affected by the 3-9 spool Airworthiness Directive. Farnair's original plan was to install the two affected engines on one aircraft and then ground it.

GEES Sales Director Jeff Hill explained that a GE On Wing SupportSM team handled the exchange at Bordeaux. The team removed both unserviceable engines and replaced them. As a result, the carrier experienced very little downtime versus the elapsed time required for two shop visits and saved the additional cost of lease engine support that would have been incurred with the traditional scenario. GE Engine Leasing is now covering the carrier's spare engine needs.

“We had all of our needs satisfied with a minimum of administrative burden,” said Chris McRae, Technical Manager, Farnair Europe. “GE had all of the tools and the experience to give the right answers and provide the right products. The reduction in cash outlay—a savings of at least \$1.54 million—was a critical selling feature for us. The shop visits were likely to be more than \$2 million due to the condition of our engines. In the present operations and economic climate, we foresee extensive use of the exchange process to satisfy our engine needs and keep the fleet generating revenue.”

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KLM and GEES cooperate for growth

In a joint presentation at the MRO conference in Hamburg in September, Peter Somers, Senior Vice President, KLM Royal Dutch Airlines Engineering & Maintenance and Dan Heintzelman, President & CEO, GE Engine Services, outlined how their companies are working together as part of a broad agreement that includes specific cooperation initiatives. An edited summary follows.

“In this cooperation process, we’ve seen a significant change in the business attitude of GE Engine Services,” Somers said. “The team we negotiated with listened to our point of view. Through excellent leadership, we executed a business deal with great potential for both parties, bringing together the strengths of an airline MRO and an OEM MRO. This can result in offerings to KLM’s broader customer base that identify airline needs, are flexible so they can be customized to meet specific customer requirements, and enhance the scope of Aircraft Total Care solutions for each airline customer.

“Airline-related MROs and OEMs share a desire to grow their businesses,” he continued. “Intense cooperation with selected OEMs will help us grow by enhancing portfolio elements. Through the CF6 and

CFM56 fleets operated by KLM and our affiliates, we bring an operator’s knowledge to the equation. GEES’ system knowledge complements this and lets us enhance our system integration expertise. We’ve identified significant areas of common interest that result in additional shop flow, portfolio expansion, creation of Repair Centers of Excellence, sharing of best practices, and more efficient logistics and asset utilization. All can help us enhance solutions for our customers and create opportunities for growth.”

Heintzelman reinforced Somers’ message: “We want to grow with our customers. By understanding their strategies and core competencies, we can bring the right resources to bear, helping them do more of what they do best. We’ll share Six Sigma learning, a broad and deep technology base, and engine system knowledge that offer the best overall solution to drive down total cost and improve operational performance.

“As KLM and we defined how we were going to work together, we identified mechanisms for growth,” he continued. “Both of us wanted success for our shareholders, so we developed explicit metrics.

“This is an example of a win-win opportunity that can be tailored to meet the unique needs of an airline so it makes business sense for all of us,” Heintzelman said. “KLM’s and our capabilities combine to make us a great team. Early results are very promising. We’ve matched demand with available assets and reduced excess materials by over \$6 million, provided linkage into our global supply network, and identified opportunities valued at over \$35 million. Every time we meet, we find new ways to work together.”

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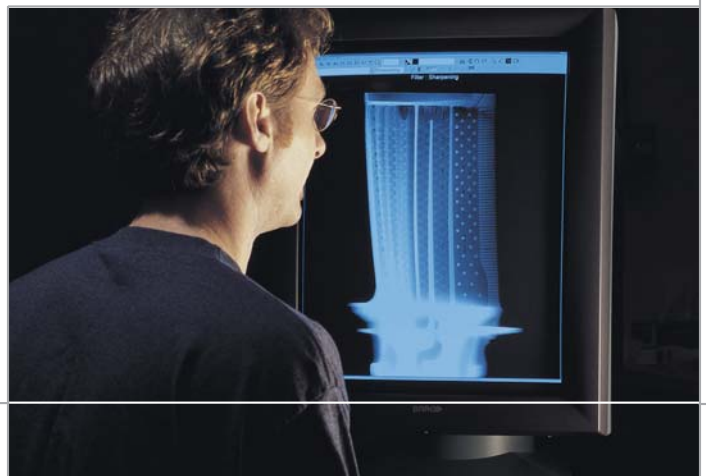
USAF launches newest GE digital x-ray system

GE delivered three real-time, digital x-ray acquisition systems to the U.S. Air Force in September for use at two of its maintenance depots. The advanced systems enable the Air Force to extend the life of its fleet.

For the Warner Robins Air Logistics Center near Macon, Georgia, the Air Force purchased a system coupled with multi-axis manipulation capabilities to produce on-aircraft, high-quality images of F-15 aircraft flight control surfaces and stabilizers. Mike Bernstein, Business Leader, GE Inspection Technologies, explained that the real-time GE detector can be controlled remotely, enabling rapid, detailed inspection of honeycomb cells in structures and identification of foreign object damage. It offers significant productivity improvements over repetitive, analog film x-ray imaging that involved taking an exposure, re-entering the facility, placing and retrieving films, and transporting films for development.

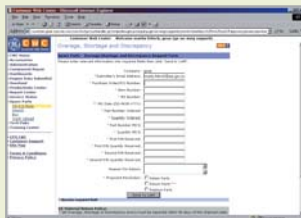
GE’s two other systems at the Oklahoma City Air Logistics Center enable real-time inspection and imaging of TF-33, KC-135, and E-3A aircraft and engine components. Operators will view images while adjusting for real-time window, level, and zoom. Image data will rapidly be transferred to a GE review and archive station for further analysis, processing, printing, and transmission.

Based on a GE Medical Systems flat panel amorphous silicon 30-Hz real-time detector, the GE system offers outstanding pixel size and real-time operation, including immediate image capture, review, transfer, and archive. GE’s acquisition systems will be incorporated into systems by Marietta X-Ray, Inc., the total system integrator selected by the Air Force.



CWC > productivity tip

> Report overages, shortages, and discrepancies online



It's now easier to report Spares shipping discrepancies to your Customer Account Manager. Simply choose the "OS&D" option on the Spares CWC, fill in the necessary information, and submit it. The submittal will be delivered to your Spares Account Manager. This helps ensure the CAM receives the information needed to begin an investigation, ultimately resulting in a more timely resolution.

New alarm manager creates buzz

Fleet Alarm Manager, the newest addition to GE's eTrend engine monitoring tools, will be available this year through the GE Customer Web Center. Besides the traditional aircraft system fault messages, this tool tracks "alarms" that include performance alerts and exceedances. Customers can view alarms, link to performance plots and historical information, and then disposition the alarm. Disposition options include closing the alarm, updating the alarm with comments, or putting engines on a watch list for follow-up or corrective actions.

Fleet Alarm Manager was developed with seven major airlines with experienced powerplant engineering organizations and a desire to better manage their fleets. Engineering can

now be more effective in recognizing anomalies, which can lead to reduced delays, increased time on wing, and reduced unscheduled removals.

All eTrend tools are Web-based versions of advanced alerting/trending software tools GE uses in providing Remote Diagnostic services and monitoring a managed fleet of engines. GE has years of experience monitoring almost 4,000 engines. By combining these tools and this expertise, GE has seen improvements that include delays and cancellations reduced by 35 percent, time on wing extended by 20 percent, and engineering maintenance cost reduced by \$5/EFH.



The purpose of *Service Solutions* is to enhance communications with our customers. Please contact us if we at GE Engine Services can be of further service to you.

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Coming in 2003 GE is building its years of experience in engine monitoring into the next eTrend tool. An intelligent analyzer is being added that draws on our extensive knowledge base to identify problems, assign probable causes, and provide recommended maintenance actions.



GE Engine Services
We bring good things to life.

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