



**GE Engine  
Services**

# service solutions

engines

maintenance

material

finance

information

## Upgrades Cut the Cost of Ownership with Less to Burn

### Continental Will Extend Time on Wing

Continental Airlines is the latest major carrier to place an order for Performance Improvement Program (PIP) upgrade kits for the GE90® engines on its 777® fleet. Continental predicts the PIP kit will provide a significant fuel burn improvement and more than 20 degrees Celsius additional exhaust gas temperature.

The kits incorporate 3D-Aero components in the high-pressure compressor, as well as new sealing, clearance and turbine technology. The PIP kits contribute to longer time on wing (TOW) and reduced maintenance cost for operators—which all contributes to a better bottom line.

“Continental has done a great job managing its 777 fleet,” said Chaker Chahrouh, general manager of the GE90 project. “With the addition of the GE90 PIP kit, this customer gets even more value with lower fuel burn and longer time on wing. This will translate to significantly lower overall cost of ownership for Continental.”



The PIP kits were developed concurrently with the GE90-94B engine that entered service in 2000. The 35 upgrade kits are targeted for installation on Continental’s 777 fleet between 2004 and 2008.

Melvyn Heard melvyn.heard@ae.ge.com (513) 243-9493



## Unison to Integrate New GENx Engine

Unison Industries, a wholly owned subsidiary of GE, will be a "Tier 1 integrator" for the electrical components package on GE's new GENx™ (GE Next-Generation) gas turbine engine. An "integrator" company in the aerospace industry has responsibility for providing a consolidated package of parts, engineering and procurement services, as well as project management for a major system or systems on an airplane or gas turbine engine.

A Tier 1 integrator works directly with aerospace manufacturers and manages development and production activities as well as those of suppliers lower in the supply chain. Improved quality, convenience, simplicity, new technology, creativity and cost efficiency are just some of the advantages customers enjoy when working directly with an integrator like Unison.

"This is Unison's first award as an electrical controls and accessories Tier 1 integrator," said Mark McWaters, Unison's OEM business manager for all GE customers. "This opportunity sets in motion the potential for GE's airline customers to consolidate their supply base and to take advantage of more predictable maintenance costs for the electrical package components on the GENx engine."

In order to support other customers in a similar fashion, Unison will continue to build its systems engineering team, which will act as a technical liaison between Unison's design engineers and GE's engine systems engineering team. Additionally, Unison's systems engineering team will provide technical project management oversight to the lower level suppliers' engineering teams.

The GENx engine is designed for the new Boeing twin-engine 7E7® aircraft. With entry into service anticipated in 2008, the 7E7 will carry 200-250 passengers up to 8,300 nautical miles. It also is expected to use 20 percent less fuel than current aircraft of comparable size.

Design and testing of the GENx electrical components will begin in 2004 and 2005 respectively.

For further information visit  
[www.unisonindustries.com](http://www.unisonindustries.com)



## Three-stop Shopping

### New shops available for CF34-3 and CF34-8 engine maintenance

Three regional maintenance shops are now available to GE CF34-3 and CF34-8 engine owners. The shops—Standard Aero in Winnipeg, Canada, IHI in Tokyo and MTU Berlin in Brandenburg, Germany—have all entered into GE Global Branded Service Agreements (GBSA), allowing them to offer the services GE shops offer on these same engine models.

As independent service providers, all three shops have been through a rigorous process in order to be selected as GE-authorized facilities and as they've grown and succeeded, they are all now adding CF34-8 capabilities to their offerings. All three shops also offer services to other third-party regional carriers for engine overhaul and maintenance needs.

These particular shops were chosen carefully by GE for their strong reputations and regional presence in their markets. By adding third-party shops into the authorized GE network, customers can be better served closer to home. All three shops will work to complement the GE overhaul center at Strother Field in Kansas.

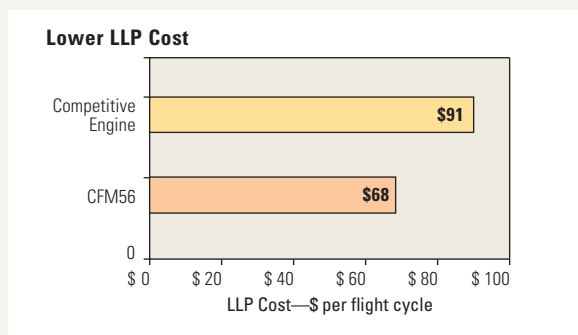
And what's the advantage to operators who use these shops? All of them use OEM technology and original equipment for all overhaul and repair services. They are also authorized to complete service bulletin repairs and any related warranty work. As well, the GBSA shops offer excellent delivery times and performance guarantees.

Jim Melvin jim.melvin@unison.ae.ge.com (904) 739-4123

Daniel Bowman daniel.m.bowman@ae.ge.com (513) 243-6609

## The Cycle of Life: An Explanation of Life Limited Parts

Life Limited Parts (LLP) are rotating parts in a turbine engine that are critical to engine integrity. Strict FAA guidelines must be followed in the design of these parts. While they are designed for long life, lower ultimate life limits are established for all the critical rotating parts. The establishment of these life limits involves the consideration of several factors, each of which may have a substantial influence on the final results. It is necessary to understand these factors so that the ultimate life of each critical rotating part can be confidently established. And, because it is nearly impossible to inspect these parts from outside the engine, and the parts carry heavy and large loads, they are removed before any problems can arise.



As GE and CFM International continue to design new engines and refine existing models, it is always a goal to decrease the number of LLPs, thus increasing engine life and decreasing cost. For example, today CFM56® engines use 18 LLPs, while a similar competitive engine model has 25 LLPs. Translated into dollars, the competitor's turbine LLP cost per flight cycle is approximately \$91, while the cost per cycle on a CFM56 engine is approximately \$68. This \$23 per cycle cost savings adds up to \$460,000 per 20,000 engine cycles—a substantial amount of money, especially for smaller fleet operators.

Once an engine enters into service, GE/CFM establish conservative life limits at certification. An arduous testing program and the experience on in-service engines are used to predict and extend the life of the LLPs to their previously established ultimate limits. GE and CFM International's philosophies are to extend the limits prior to fleet leader requirements. Currently on CFM56-5B/P engines, 13 out of 18 LLPs have had their life limits extended, and the other five parts are expected to be extended well before the fleet leader's parts reach the current limits.

Today, GE and CFM engines have fewer LLPs than their competitors do, and the parts are rated to last longer for more time on wing and reduced maintenance cost.

## Predictable and Proud: Shenzhen Airlines Taps GE For 10-Year Engine Maintenance Agreement that Provides Predictability

Shenzhen Airlines has signed a 10-year Maintenance Cost Per Hour<sup>SM</sup> (MCPH<sup>SM</sup>) contract with GE. The maintenance agreement provides service to the airline's fleet of nine CFM56-3C1 engines. All maintenance services will be completed at GE's Malaysia facility, which previously serviced the CFM56-3 engines powering Shenzhen's four Boeing 737® aircraft.

The MCPH program provides engine maintenance at a fixed price per flight hour, establishing more predictable maintenance costs for Shenzhen operations than traditional time and material service programs.

"We have great confidence in the quality GE's engine services provide, and we are pleased to be entering into a long-term relationship with them," said Yang Jia Bao, Vice President of Shenzhen Airlines. "This relationship will not only help keep

our maintenance costs more predictable, it also helps us meet the commitment for safety and reliability that we have made to our customers."



Shenzhen Airlines is one of the fastest growing airlines in China, operating both domestic and international routes. It has received awards from "National Passengers Assessment on Civil Aviation" and "National Customer Satisfied Enterprise" for providing the best customer services as recognized by the Chinese aviation industry.

# CWC > productivity tip

## > For More Productivity, Modifications are in Order

The CWC team is dedicated to driving process improvements and increasing productivity for GE engine customers. Currently, the team is targeting customers who have manual processes and are willing to proceed to the next level.

Jerry Funk, CWC lead for commercial spares, has been working with his IT team to make online order modifications available to customers. "From the data that we have analyzed, we have identified that one of the largest opportunities for productivity gain was in order modifications," Funk explained.

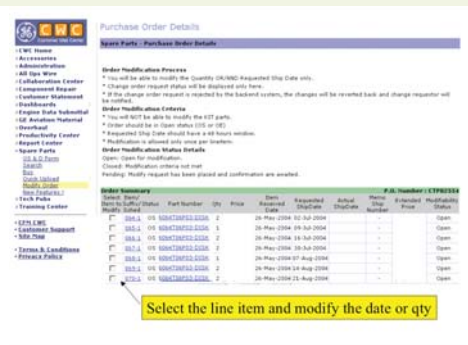
Currently, customers who do not use Electronic Data Interchange (EDI) need to make all order adjustments through their customer account managers by email or by fax. But, with the new system, customers can access orders themselves and make modifications.

This saves time, prevents potential miscommunications and gives customers more autonomy.

Funk worked with H+S Aviation in Portsmouth, England to develop the parameters for this new program and to initiate a pilot program. "The program has been very successful and gives the customers live updates on order modifications and allows them to better manage their own inventory," said H+S Aviation Inventory Controller Gary Hampson.

The program will be very easy for customers, as well. First, they access the Spare Parts page, click on Modify Order, then enter a purchase order or part number they are seeking. Once that is on screen, they select the line item to be modified and make the appropriate change. This can be completed within minutes by customers from their locations without ever taking the time to call or fax the changes to a customer service manager.

"We are dedicated to making this work and we will continue to add more functionality and value to the CWC as this program rolls out to all customers," said Funk. "Between our internal team and with the help of customers interested in digitizing their processes, we will continue to explore any and all feasible opportunities to continue driving improvements."



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

US, CANADA & LATIN AMERICA

**Tom Curtis**  
Western United States  
tom.curtis@ae.ge.com  
(513) 243-7890  
Fax: (513) 243-8509

**Russ Shelton**  
Eastern United States and Canada  
russ.shelton@ae.ge.com  
(513) 243-7896  
Fax: (513) 243-2994

**Doug Izarra**  
Latin America  
doug.izarra@ae.ge.com  
(305) 267-4303  
Fax: (305) 267-4300

WESTERN & CENTRAL EUROPE

**Jack Lutze**  
Western and Central Europe  
jack.lutze@ae.ge.com  
33-1-4765-7611  
Fax: 33-1-4642-9403

**Klaus Huber**  
Central Europe  
klaus.huber@ae.ge.com  
(513) 243-7824  
Fax: (513) 243-2412

UK, IRELAND & AFRICA

**George Duncanson**  
george.duncanson@ae.ge.com  
44-20-8897-4206  
Fax: 44-20-8897-4003/4899

EASTERN EUROPE, MIDDLE EAST & CENTRAL ASIA

**Muhammad Al-Lamadani**  
muhammad.al-lamadani@ae.ge.com  
(513) 243-4090  
Fax: (513) 243-2412

GREATER CHINA REGION

**Li Hsi**  
li.hsi@ae.ge.com  
86-21-3222-4508 ext. 300  
Fax: 86-2-2546-1057

JAPAN

**Kenji Uenishi**  
kenji.uenishi@ae.ge.com  
81-3-3588-5211  
Fax: 81-3-3588-5210

KOREA

**Steve Tagariello**  
steve.tagariello@ae.ge.com  
82-2-390-3456  
Fax: 82-2-390-3482

SOUTH ASIA PACIFIC

**Max York**  
max.york@ae.ge.com  
61-2-9965-1403  
Fax: 61-2-9965-1408

Jerry Funk jerry.funk@ae.ge.com (513) 552-5661

© 2004 General Electric Company. All rights reserved. GE Engine Services, Inc. is a wholly owned subsidiary of General Electric Company. GE and are registered trademarks of General Electric Company.

GE90 is a registered trademark of General Electric Company.

CFM56 is a registered trademark of CFM International, a joint company of Snecma Moteurs, France, and General Electric Company.

737, 777 and 7E7 are registered trademarks of The Boeing Company.

GEEx is a trademark of General Electric Company.



### GE Engine Services

GE Engine Services, Inc.  
One Neumann Way F118  
Cincinnati, OH 45215 U.S.A.  
Phone: (513) 552-3272 (internationally)  
(877) 432-3272 (within U.S.)  
Fax: (513) 552-3329  
E-mail: [servicesolutions@ae.ge.com](mailto:servicesolutions@ae.ge.com)