



GE Engine Services

Service Solutions

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Making a good engine even better. Air France invests for future.

Air France has awarded a contract for CF6-50 engine hot section upgrade kits for its GE Aircraft Engines (GEAE)-powered fleet of

early-model Boeing 747s. GEAE will provide up to 106 kits for the airline's 747-200/300 fleet. Incorporating advanced turbine materials, coatings and cooling technology from the latest generation of aircraft engine design into an engine launched in the 1970s, the kits will provide significant improvement in engine life, cost of ownership and long-term residual value.

GE Engine Services performed CF6-50 upgrade engine testing and jointly managed the now-complete FAA certification process with the GEAE CF6 Project team. Air France

Industries will install the kits when it overhauls the engines.

The upgrade kit allows customers to achieve up to a 25% improvement in time on wing, improved EGT margin retention and a reduction in shop visits, scrap repair and material costs. To complement the upgrade and allow customers to customize packages for their requirements, GEAE is also making combustor and turbine mid-frames available.

More than 150 of the kits are now on order.

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Aviation Systems International (ASI), a parts distributor and engine management firm owned

ASI: Building Relationships



by Bank One and the Carlisle Group in New York, has signed the first-ever five-year contract with GE On Wing SupportSM services. Located in Boca Raton, Florida, ASI owns a number of CF6-powered A300 aircraft and employs more than 60 people.

ASI's satisfaction with their current exclusive three-year component repair contract and previous On Wing Support experiences led to the

decision to expand their business relationship with GE Engine Services by customizing the service agreement.

"GE offers excellent customer service and treats us like an airline," said Mark von Husen, ASI's Director of Engine Services. "Not only do we get first-rate, world-class support from the Sales and Customer Service teams, along with the On Wing Support people, but we know we always have an advocate within GE to help us get things done right and quickly.

"For example, we bought several DC-10-30 aircraft, one of which

had an engine that had been damaged during removal. During a one-week period, three GE On Wing Support teams provided invaluable, distinct, on-site services that enabled us to prepare the engines for shipment and to close a very large deal with a major international airline.

"GE's advantage is that they can do anything on any of their engines," he continued. "That's very important to me, because I don't have time to shop pieces of repairs.

"My dealings with GE allow me to run my business in all environments at all times."

Introducing GE Inspection Technologies

GE Aircraft Engines (GEAE) has created a new business, GE Inspection Technologies (GEIT), to allow

customers to benefit more fully from GE's broad spectrum of inspection technologies. The business provides advanced, state-of-the-art inspection

of other industries in which precision and high quality are critical.

GEIT will:


- sell the equipment and provide training on its use, or
- perform comprehensive inspection services for customer materials and goods, either at a GE site or the customer's facility, using the same type of equipment, specifically developed for field use, and
- provide consulting services for customers who are looking to enhance their existing NDT operations.

GEIT leverages the considerable technical expertise of GEAE, other GE businesses and Corporate Research and Development to develop its products. For example, with an investment of about \$500 million and as the subject of more than 100 US patents, GE Medical Systems' revolutionary flat-panel, digital X-ray inspection detector has been adapted to a GEIT system that offers industrial firms unprecedented digital inspection capabilities, without the need for film or

chemicals and the associated environmental concerns. Other benefits of the Radiographic Digital X-ray System include high reliability, lower operating costs, reduced cycle time and increased productivity.

Additional nondestructive inspection solutions offered by GEIT include X-ray Computed Tomography, a type of 3D imaging technology, and Eddy Current procedures such as Eddy Current Array, which employs a flexible probe to inspect areas of complex geometry and/or limited accessibility. Initiatives under development include: Transient Infrared Thermography, a low-cost alternative to many surface and subsurface inspection techniques; Phased Array Ultrasound, which simultaneously scans objects at multiple depths; and Pulsed Eddy Current for rapid surface and multilayer inspection of large areas.

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GE's flat-panel, digital X-ray equipment will enable a GE Engine Services facility to increase imaging productivity by 1,300 man-hours per year and improve customer satisfaction levels. This same productivity leap is now available to our customers.

equipment and sophisticated inspection services to the aerospace industry, as well as to a broad range

USA 3000 Airlines has awarded GE Engine Services (GEES) a 10-year Maintenance Cost Per HourSM (MCPHSM) contract. The agreement calls for GEES to

USA 3000 ensures predictable costs



maintain the airline's fleet of five leased CFM 56-5B4P-powered Airbus A320 aircraft, including repair and overhaul, as well as an option for two additional aircraft.

"We're very happy to team up with the professionals at GE Engine Services," said James Kenney, president of USA 3000. "Their turnkey approach to engine monitoring and maintenance provides us with a very comfortable level of protection."

The MCPH program capitalizes on GE Engine Services' extensive services network, engineering resources and program management expertise to maintain the

individual customer's fleet, based on a flat rate per engine flight hour. This enables the customer to forecast operating costs with greater accuracy.

George Oliver, President and CEO of GE Engine Services, stated: "The MCPH program allows customers to benefit from GE's product expertise and knowledge while meeting their demand for a low-risk maintenance support solution."

USA 3000 Airlines, a subsidiary of Apple Vacations, took delivery of the first of seven new A320 aircraft in October. Configured for 168 passengers, the aircraft will be based in Philadelphia, New York (Newark) and Chicago. Initial plans call for them to operate from these cities to such popular resort destinations as Cancun/Riviera Maya and Puerto Vallarta in Mexico, and Punta Cana in the Dominican Republic.



The Guaranteed Spare Engine Availability (GSEA) service of GE Engine Leasing (GEEL) can guarantee

Spare engines guaranteed

that an appropriate spare engine will be available within 24 hours of an airline's call—any day of the week—at a pre-agreed price. GEEL assumes all risks and administrative burden of such coverage, freeing up airline financial resources. The product provides customers with the benefits of GEEL's large pool of spare engines and its expertise in spare engine management.

A larger airline can operate with a lower ratio of spare engines in their fleet than a smaller one. To capture that advantage for the customer, GEEL pools its engines by combining the short-term needs of many smaller airlines into what is, in effect, a large airline fleet. We can then use our pool of spare engines more efficiently than an individual airline. The result is guaranteed spare engine coverage at a price that's less than the airline's cost to carry

underutilized spares. Customers access this program by paying a fee based on the number of aircraft supported plus a fixed daily rental for use of the engine.

GEEL can tailor a GSEA program to meet each airline's needs. The options are:

Top-off coverage: The airline provides a number of spare engines that are expected to be in use most of the time; GEEL provides for any additional needs through pool access.

Full coverage: GEEL provides engines to meet all the airline's spares needs; GSEA can be combined with Operating Leases

or other spare engine financing. GEEL can also purchase excess spare engines to initiate the GSEA program with a customer.

Through the GSEA service, GEEL supplies a wide range of engines, including the CF6-6, CF6-50, CF6-80C2 and CFM56-5C4. Programs to provide CF34 and CF6-80E engines are underway. Additionally, we cover the CFM56-3, -5B and -7 lines through CFM's Shannon Engine Support.

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Cost Comparison: GSEA vs. Ownership

EXAMPLE: An airline has a 10-aircraft fleet requiring 2.5 spare engines by traditional standards. The cost of the third spare engine is \$500,000/year.

Assumptions: Cost of \$4 million, 5% annual depreciation, 6.5% borrowing cost, 1% administrative charge for holding engine, 30% per year utilization of engine and \$150,000 maximum annual fee with \$100,000 rebate upon lease of engine.

	Own the Spare	GSEA
Confidence level	95%	100%
Ownership cost	\$500,000	\$0
GSEA access fees	0	\$50,000
Rental charges (116 days)	0	\$231,000
Lost interest income on fees	0	\$7,500
Total cost	\$500,000	\$288,500

Annual cost savings = \$211,500; 100% confidence level achieved

GE Engine Services' new Speed Cell enabled United Airlines to realize a significant cost savings this summer by avoiding the scrapping of an expensive component. The repair of an extensively damaged combustion case entailed welding of multiple

Speed Cell cuts United's costs

areas forward of the mid-flange and of cracks in the compressor discharge pressure pad area. The coordinated effort by GE ACSC repair shops, Product Support, Design and Repair Development Engineering culminated in the shipment of a serviceable case, providing strong customer service to United.

"After working with GE Engine Services for a number of years, the new Speed Cell promises to be a significant step towards improved customer support and provides the opportunity to combine our valuable experience and technical expertise for joint repair development," said Mike Harris, United Airlines' Manager of Manufacturing Engineering. "This new GE concept has already resulted in saving United more than \$277,000 in part replacement costs."

Having listened closely to customer input, GE created the dedicated repair facility Speed Cell design to quickly address the repair needs of customers. Responsible for design, demonstration and development of new repairs, the Cell team has the appropriate equipment in place to support high-tech repairs. GE staffed the cell with experienced Repair/Manufacturing

Engineers with extensive design, manufacturing and materials background. Additionally, GE is placing Service Application Engineers (SAEs) on-site at the customer's facilities. SAEs will assist the customer by identifying repair needs and salvation opportunities, including the quick disposition of unserviceable material, with the goal of reducing the customer's cost of ownership of GE engines.



Besides the success with United, GE's technical team and Speed Cell team have worked with Snecma Engineering to develop a repair for the CFM56-3 Turbine Rear Frame. The frame from Ansett had a broken ground handling mount not covered in the Repair Manual. The speed Cell turned the frame in 35 days, which included development—resulting in a customer savings of more than \$300,000.

Additionally, for another customer, a GE repair team turned a fan frame damaged during the assembly process. This was a critical expedite to meet a customer delivery. An on-site weld repair corrected the situation, allowing the engine to be shipped on time.

Working directly with airlines on salvation of hardware, GE has identified customer savings of more than \$35 million so far in 2001.

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GE Celma S.A., a key part of GE's global aviation services network, is celebrating its fiftieth anniversary this year. Located

GE Celma: 50 years of progress

in Petrópolis, Brazil, the facility continues to improve its already-strong reputation.

Proven quality, superior turnaround time (TAT), competitive pricing and



excellent customer satisfaction make GE Celma a GE "Center of Excellence" for JT8D overhaul. GE has invested heavily in personnel development, providing more than 135,000 man-hours of training annually and several other education and training initiatives regionally. GE Celma's dedicated workforce demonstrates tremendous pride in its work. This is evidenced by an employee turnover rate of less than 1% per year.

Customers directly benefit from the wealth of expertise on-site, as well as many quality and process initiatives, including:

- **TAT-reducing initiatives.** Since the start of 2001, TAT has averaged less than 38 days, compared to an industry average of approximately 60. Each step of the production process and each incoming engine has an assigned "owner" who monitors an engine's progress through the shop to ensure promised TATs are met. GE Celma has met customer commitments 93% of the time in both 2000 and 2001 (year-to-date). Additionally, GE's redesign of the overhaul, component repair and accessories shops using the Six Sigma process has helped enable this consistent record.
- **The Customer Service Team** keeps customers informed of all shop service details related to progress and cost forecasting.
- **GE's "Blue Line" procedure** has reduced transit time to GE Celma for engines from an average of ten days to three days. The procedure, a unique partnership between GE Celma, Brazilian Customs, the Airport Authority and GE's freight forwarder, integrates all aspects of the shipping process.


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View *Service Solutions* online at <http://www.geae.com/servicesolutions>



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Service Solutions

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

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