New Boeing 777-300ER Bristles with Technology

The world's most technologically advanced airplane, the 777, is now even more high-tech. New technology being added to the newest Boeing [NYSE: BA] 777 model, the 777-300ER (Extended Range) makes dollars and sense to the airlines that fly them.

"We don't add technology just for technology's sake," said Lars Andersen, program manager for Boeing 777 Longer Range airplane programs. "Our aim is to add technology that brings value to our customers -- airlines and the flying public -- alike."

That value is visible both inside and outside the 777-300ER airplanes. Innovative features that use the crown of the airplane to locate rest areas for off-duty pilots and flight attendants, who need rest during long flights, and new lighter, more powerful computers are just a few of the technological improvements to the 777 family.

While many improvements are being tested on Boeing's newest 777, the 777-300ER, some are being immediately put into service on other 777 models.

Overhead rests allow airlines more seats for paying customers

Until now the crown of the 777 airplane was filled with structure, wires, tubes and ducts. With the redesign of the overhead structure and systems, two crew and a six-to-eight bunk flight attendant rests can be accommodated.

Boeing offers overhead pilot and flight attendant rests in its longest range 777: the 777-200ER, 777-300ER and 777-200LR (Long Range) jetliners.

By moving crew and attendant quarters off the main deck, airlines can free as many as four-to-seven revenue seats, which can then be used for passengers. Using overhead space for crew rests areas also frees up room for an additional four-to-six LD-3 containers in the cargo hold. These containers can be used for additional cargo.

The first in-production overhead crew and flight attendant rests were installed in a 777-200ER airplane that was delivered in May 2003. The new crown structure and systems also will be included in all of the 777-300ER and 777-200LR airplanes.

Boeing also is working with customers on other possible uses for this space including cabin equipment centers and closets.

Computerized EFB eliminates need for charts and books

The days of pilots enduring the backache caused by lugging heavy bags filled with navigation charts, logbooks, and manuals from flight to flight are coming to an end. This is good news for pilots, but it's also good news for their airline employers.

The Electronic Flight Bag (EFB), produced by Jeppesen, a Boeing company, will not only shrink those heavy bags onto a computer hard drive, but also will give airlines increased revenue, reduced dispatch delays, and savings in fuel usage and increased engine life, while enhancing pilot situational awareness and even enhancing security.

The Electronic Flight Bag can contain all documentation and forms carried by pilots -- aeronautical charts, manuals for fault reporting and operations, minimum equipment lists and logbooks -- in digital format at the crew's fingertips. It also includes a weight-and-balance calculator that allows pilots to calculate the ideal speeds and engine setting for an aircraft instantly, in any weather, on any runway, with any payload.

These instant calculations could increase the payload of a 777 taking off on a wet runway by as much as 9,000 kilograms (20,000 pounds).

The first Electronic Flight Bag to be installed on a 777 will be delivered in October 2003 to KLM Royal Dutch Airlines.

Smaller, more powerful computers and new software soon to be in service

Speaking of computers, the 777 family is undergoing its first major avionics upgrade since its introduction in 1995. New smaller and lighter weight computers are being installed, which have ample room for growth. In addition to the new computers, four key airplane systems have been updated: Airplane Information Management System, Electrical Load Management System, Primary Flight Computer and Air Supply and Cabin Pressure Controller.

The new systems were tested on the 777-300ER. The first 777 with these new systems will be delivered on a 777-200ER in October 2003.

Changes that improve the airplane's performance are also visible outside the airplane. These performance-enhancing changes include: tail-strike protection, raked wingtips, new engines, a new main landing gear, strengthened nose gear and new wheels, tires and brakes (supplied by Goodrich and Messier-Bugatti).

Tail-strike protection allows increased weight at takeoff

Flight testing of the Boeing 777-300ER has verified the performance of numerous special features. One such feature, Tail-Strike protection, helps prevent tail contact with the ground on takeoff. Operating through the airplane's fly-by-wire flight controls, the system allows the airplane to lift off at reduced speed, increasing allowable takeoff weight by 4,000 to 10,000 pounds (1,814 to 4,536 kilograms), depending on airport conditions and airplane structural limits.

"It's in the primary flight computer," said Frank Santoni, Boeing 777 chief pilot, of the special feature. "It's a function that looks at rate of closure of the tail to the ground during rotation, measuring how fast and at what distance the tail is moving toward the pavement."

If the tail gets too close to the ground, the system moves the elevator for slower nose rotation. During abuse takeoff testing, where Santoni has deliberately rotated the airplane early and fast, the system has responded as designed.

"It's doing a superb job, which is testament to our engineering team," Santoni said. "On the 777-300 program six years ago we did the same takeoff performance tests and contacted the tail about 12 times, which is expected during flight-test. On this program, we haven't touched once."

New landing gear permits takeoffs on shorter runways

A new semi-levered landing gear, manufactured by Goodrich Corp., allows the 777-300ER to lift its nose early during takeoff by shifting the center of rotation from the main axle to aft axle of the three-axle landing gear truck. As the airplane rotates, the nose is allowed to rise higher earlier.

"While the tail-strike protection system and semi-levered landing gear are independent of each other, both give our customers the ability to take off on shorter runways or put more payload on the airplane for the same length of runway," Santoni said.

Raked wingtips save fuel, reduce CO^2 emissions

Raked wingtips that were designed for the 777-300ER, not only improve the bottom line -- they're good for the environment. The highly tapered wingtip extensions improve the airplane's performance, help reduce takeoff field length and increase fuel efficiency and climb performance. Faster climb performance can mean quieter neighborhoods.

Through the use of raked wingtips, the 777-300ER is expected to achieve a 2 percent fuel efficiency improvement, saving as much as $140,000 U.S. dollars on fuel costs per year per airplane. This equates to a savings of 1.3 million pounds of fuel per year per airplane, and 3.9 million less pounds of global warning carbon dioxide (CO^2) being emitted into the environment.

More powerful jet engine allow unmatched range and speed

Two General Electric [NYSE:GE] GE90-115B engines power the 777-300ER and 777-200LR, which is in development. Each engine produces 115,000 pounds of thrust -- nearly a quarter of a million pounds of total thrust for the airplane. By comparison, the original 777-200 had 75,000 pounds of thrust per engine.

That power, which permits unmatched range and speed, comes at very little expense. Fuel mileage testing shows a 1 percent improvement in fuel efficiency over original predictions. Such an improvement can reduce by 106,400 gallons (402,724 liters) annually the amount of fuel one airplane uses. That's enough to power 130 automobiles for one year.

"It's just an amazing engine," said 777 Senior Test Pilot Suzanna Darcy-Hennemann of performance evaluations. "It's smooth and quiet. It also allows the airplane to take off and climb very quickly."

The additional thrust increases the 777-300ER's maximum take-off weight to 759,600 pounds -- almost 100,000 pounds more than the 777-300 -- with virtually no difference in handling characteristics during takeoff, flight and landing.

Twin-engine economics, reliability to the long-range market

As a two-engine airplane, the 777 often flies ETOPS -- or extended-range operations with two-engine -- routes. ETOPS is a conservative, evolutionary program that lets airlines fly two-engine jetliners on extended routes that at some point are more than 60 minutes of flying time from an airport.

Enormously successful, ETOPS has demonstrated the suitability of twinjets to long-range and very-long-range operations. More than 3.3 million ETOPS twinjet flights have been logged since 1985, and about 125 operators perform 1,100 more every day. Boeing twinjets have performed more than 2.6 million ETOPS flights, and 94 Boeing operators around the world fly nearly 1,000 more each day.

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