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The Boeing 777

FOR a new airliner to enter into American and European commercial service, the U.S. Federal Aviation Administration (FAA) and the European Joint Aviation Authorities (fAA) must formally certify the plane. Production certification attests to the soundness of the manufacturing methods used to build the new aircraft, and type-design certification attests to the completion of all safety tests within specifications.

Once granted production and type-design certification, the plane can go into full production and is approved for service in all European and American markets. On Apri! 19, 1995, both agencies granted production and type-design certification to the Boeing 777.

In a little more than five years, this plane went from concept approval of the Boeing Board of Directors to a fully functional, record-setting, and award-winning airplane. Perhaps the first of the innovative strategies that went into the design and fabrication of this piano was the exclusive use of computer-aided drafting and design (CADD).

In May 1991, Boeing moved quickly to take advantage of the technology of other nations for the joint development and construction of the 777. Boeing reports that Fuji, Kawasaki, and Mitsubishi Heavy Industries jointly developed 20 percent of the 777 airframe. Since Boeing doesn't build jet engines, the company also contracted with other aerospace companies to manufacture the engines for the 777. Jet engines constructed by General Electric of Cincinnati, OH; Pratt and Whitney of East Hartford, CT; and Rolls-Royce of London, England, power the 777.

Cockpit of the Boeing 777

In March 1992, Boeing started testing the 777 flight control system on a modified 757 aircraft. The design of this control system is controversial because of its fly-by-wire characteristics which allow silicon memory chips to control some decisions that pilots have always made in the past.

In October 1992, Boeing completed its new Integrated Aircraft Systems Laboratory. At this facility, engineers computer tested the 777 systems and manufacturing technologies under all kinds of simulated conditions.

The tests of the new systems included seven-month-long fatigue tests of the 777 structure. Hydraulic test actuators in combination with stress and strain gauge equipment put the craft through all kinds of dynamic loads not experienced by aircraft within their service lifetime. The stresses exposed the structure to twice the fatigue that a plane could ever experience in service.

The craft even survived a full-scale static-destruction test in which its wings were bent back 24' from their normal position. This load actually exceeded the design specifications of the 777, which called for the plane to withstand a load one and a half times what it would experience under the most extreme flying conditions. The results of all testing were so impressive that the plane received full certification in record time and is the first plane to receive, upon entry into service, approval to fly the most direct trans-oceanic routes between cities.

When your travel plans call for flying, and your point of origin and destination can include the 777, you might keep some facts in mind. You will be traveling with 304 to 439 fellow passengers, sitting six to ten abreast. Airlines will determine the seating capacity and configuration, The machine that is carrying you to your destination contains 132,500 parts specifically engineered for it. These parts represent approximately 4.5 percent of the 3,000,000 parts that make up the 777, an airplane built to carry passengers and cargo into the twenty-first century.

Recalling the Facts

1. In what way is the 777 actually an example of international cooperation and shared technology?
2. Describe some of the procedures that Boeing used to test the stress capabilities of the 777.
3. In what way does the fly-by-wire control system differ from the airplane control systems of the past? TD

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