

Future of planes, in a word? Plastics

PLANES, From Page 13

cent less fuel than existing jets of this size. Airbus says its slightly larger A350, which is still in the design phase and not expected to enter service until 2013, will be made of 52 percent composites and achieve comparable levels of fuel efficiency.

But lighter planes don't just burn less fuel. Since airport landing fees are partly based on the weight of the aircraft, a lighter fleet can represent a significant cost saving to airlines. According to the IATA, airlines and passengers pay at least \$43.5 billion a year in airport landing fees and other taxes, equivalent to 11 percent of global airline revenue.

Jet manufacturers say composites also resist fatigue and erosion better than metal, which reduces maintenance costs because regular jet inspections do not need to be as frequent or extensive. Jeanne Yu, an engineer who heads Boeing's environmental performance group, said maintenance intervals for composite-built jets could be as much as twice as long as those for aluminum planes, although regulators are likely to await proof of manufacturers' claims before approving significant changes to current inspection regimes. Following the November 2001 crash of an American Airlines Airbus A300, in which a composite tail fin broke off, some air safety experts called for stricter standards for inspecting and repairing composite components.

According to the International Civil Aviation Organization, airlines spent \$41.7 billion on maintenance in 2005, the most recent year for which statistics were available, equivalent to 10 percent of total industry operating costs.

Besides slashing fuel consumption, "savings on maintenance is the main factor that makes composites attractive to airlines," said Scott Hamilton, an analyst based in Issequal, Washington.

For jet manufacturers, meanwhile, composites can simplify the production process because they allow for the creation of larger, more integrated parts. According to Boeing, this could eventually help speed up its assembly lines by as much as 40 percent. And since composite sections are cast into precise molds, they do not, like aluminum, have to be cut and shaped

from sheets of bulk material, which eliminates a lot of waste.

And there are some benefits for passenger comfort. Because they are stronger and stiffer than aluminum, composites make it possible for airlines to increase the air pressure in the cabin significantly. Cabin air pressure in aluminum wide-body jets is typically equivalent to what a person would experience at an elevation of 8,000 feet, or 2,400 meters, above sea level, a factor that contributes to the fatigue that travelers experience on long-haul flights.

Boeing says air pressure on the 787 will be the equivalent of an elevation of 6,000 feet, while Airbus plans to pressurize the A350 at 5,000 feet. Com-

**'Our carbon footprint
is growing,
and that is not
politically acceptable.'**

posites' resistance to corrosion also means that the relative humidity of the air inside the cabin can be higher than the 10 percent to 20 percent typical on today's planes an improvement for passengers because dry air is another source of discomfort.

The technology of building airplanes has taken quantum leaps forward since Orville and Wilbur Wright's first biplane — made of wood, wire and cloth — lifted off at Kitty Hawk, North Carolina, in 1903. In the decades that followed, manufacturers have experimented, with varying levels of success, with everything from plywood to aluminum, titanium and other strong but lightweight metals.

Boeing began experimenting with fiberglass in the 1960s with the 747 program, using it on certain control surfaces of the plane, as well as on fairings — the joint where the wing meets the fuselage — and trailing edge panels on the wings and tail.

Boeing's use of these ultra-light materials has increased significantly in the past decade, with the 777 wide-body made of about 11 percent composites — most of it in the tail section.

Airbus, too, has stepped up its use of

composites in the wing and tail sections of its single-aisle A320 family as well as in its widebody A330 and A340 jets. Its 555-seat A380 superjumbo, due to enter service at the end of this year, is made of 25 percent composite and other advanced materials, offering a weight saving of about 15 metric tons.

"The trend is clearly towards more composite," Jeff Turner, the chief executive of Spirit Aerosystems, which builds carbon-fiber and other composite components for Boeing and Airbus, told investors at a meeting in March. "Whether it totally eclipses the metal airplane or not, I couldn't say."

Spirit, which was spun off from Boeing in 2003, is building the all-composite nose sections of the 787 in its Wichita, Kansas, factory. The sections are molded as a single piece, measuring 42 feet long and 21 feet wide. Spirit is reported to be in negotiations with Airbus about taking control of Airbus's composite wing factory in Filton, England, and is eager to get a major role in production of the A350-XWB. It already makes some wing components out of composites for Airbus's A320 family.

Boeing and Airbus have so far chosen to use composites in different ways on their latest planes. While the fuselage of the 787 is made entirely of interconnecting composite barrels, the A350 uses a series of panels made of composite "skin" mounted on a more traditional aircraft frame that is made of a mix of aluminum and composites.

Engineers may continue to debate the relative merits of different composite-designed jets for many years to come. But it is clear that aircraft manufacturing has crossed a technological threshold with the 787 and the A350 that will shape the way all future aircraft are built.

"There is no going back," said Wheeldon of BGC Partners. "Plastic has finally made its mark in the big toys."

iht.com

Full coverage of the Paris Air Show continues Monday, with a special report on the Airbus-Boeing rivalry and trends ranging from alternative fuels to tax policy. And join the discussion on the aviation industry's attempts to become more climate-friendly on the Business of Green blog at iht.com/bog.