

Advanced Materials  
Reducing weight and fuel costs  
in the aerospace industry



### Lighter-weight composite airplane parts help aerospace industry lower fuel costs

The growth in the use of lighter and stronger carbon-fiber composite parts to build airplanes has taken off, literally, thanks to Araldite® multifunctional epoxy resins made by Huntsman.

Huntsman supplies the high-performance epoxy resins and curatives found in the majority of composite parts used in the newest generation of aircraft today. The use of these lighter and stronger materials has dramatically grown over the past decade, resulting in greater fuel efficiency and lower costs for the airline industry.

According to a recent article in Composites World magazine, fuel purchases represent 30 to 40 percent of a transport aircraft's direct operating costs and jet fuel prices continue to climb. They are 18 percent higher today than they were five years ago.

"Every pound on a plane – from passengers and luggage to airplane parts – equates to about \$10,000 in fuel costs every year. If you can reduce the weight of the airplane, you will reduce your fuel needs and lower operating costs," says Carl Holt, Aerospace & Composites Marketing Manager.

Huntsman has been providing products to improve airplane construction for more than 60 years. Its Araldite® adhesive was first used on the De Havilland Mosquito fighter plane manufactured in Europe during World War II. Today, Huntsman's multifunctional epoxy resins are used, along with carbon fiber, to create prepreg materials that go into carbon-fiber composite airplane parts.

The use of these lighter-weight parts has been a gradual transformation. In the 1980s, the U.S. Air Force began using carbon-fiber parts to build a new generation of high-performance warplanes, and the commercial airline industry took notice.

"Most commercial airplanes at that time were predominately aluminum. As steel costs continued to creep up, airline manufacturers began to look for lighter and less expensive materials," Holt says.

Cargo airplane manufacturers began testing carbon-fiber composite parts on secondary areas of the aircraft, such as winglets, doors and leading edges of wings. In the late 1980s and 1990s, they began using composites in primary, or load-bearing, structures such as tail sections.

Today, two of the largest airplane manufacturers, Boeing and Airbus, are building new commercial models made of more than 50 percent carbon-fiber composite parts. Not only do they make planes lighter, they help reduce cabin pressure and

lower environmental noise to improve the flying experience for passengers.

The Airbus A380, the world's largest passenger airliner with seating for more than 500 passengers, makes wide use of composite materials on flaps, engine cowlings, spoilers and the fairing that covers the lower part of the fuselage around wings and landing gear. Next-generation fan blades on airplane engines will be made entirely from composites.

In addition to multifunctional epoxy resins, Huntsman also provides the high-performance epoxy adhesives and epoxy syntactic materials which are primarily used for reinforcing honeycomb composite panels in aircraft floors, galley walls, bulkheads and more. Huntsman's laminating systems also are used for manufacturing and repairing composite radomes, fairings, flight control surfaces, cargo and cabin panels in aircraft.

As sophisticated computer-aided design and computer-aided machining programs are developed, Huntsman also leads the industry in the introduction of technologically advanced modeling and tooling boards, die-forming materials and modeling pastes for the aerospace industry.

"From design to part production and maintenance, Huntsman provides the aerospace industry with a wide range of innovative technologies that allow aircraft manufacturers to build lighter aircraft that are stronger and more fuel efficient while offering travelers greater comfort," Holt adds.