



A green machine

An engineering team at Boeing Research & Technology Europe conducted three test flights of a manned airplane powered by hydrogen fuel cells. The research is an example of how Boeing is exploring future improvements in the environmental performance of aerospace products.

Boeing makes history with flights of Fuel Cell Demonstrator Airplane

By TOM KOEHLER

An engineering team at Boeing Research & Technology Europe in Madrid, Spain, has demonstrated for the first time that man can fly in an airplane powered by clean, quiet hydrogen fuel cells only.

During three flights in February and March, a piloted motor-glider, modified by Boeing, with assistance from industry partners in Austria, France, Germany, Spain, the United Kingdom and the United States, flew straight and level for approximately 20 minutes on power solely generated by the fuel cells.

Company leaders said the history-making research is a tangible example of how Boeing is working to develop new technologies for environmentally progressive aerospace products. It also shows how Boeing is reaching out to work with the best and brightest engineers and scientists in the world to explore the most innovative and affordable aerospace solutions for its customers.

"I have a great deal of pride in the creative Boeing Research & Technology Europe team," said John Tracy, Boeing senior vice president of Engineering, Operations & Technology and chief technology officer. "They have demonstrated the potential of integrating fuel cell technology into aerospace products and the promise of a brighter, greener future."

"This Fuel Cell Demonstrator Airplane project has given us an opportunity to demonstrate our capabilities," said Paco Escarti, BR&TE's managing director. "It has been a great satisfaction to see the talents and innovative spirit of our team put to use."

A two-seat Dimona airplane, built by Diamond Aircraft Industries of Austria, was used as the airframe. With a 53.5-foot (16.3-meter) wingspan, it was modified by BR&TE to include a Proton Exchange Membrane (PEM) fuel cell/lithium-ion battery hybrid system to power an electric motor coupled to a conventional propeller.

During the flights, which took place at the airfield in Ocana, Spain, pilot Cecilio Barberan climbed to an altitude of 3,300 feet (1,000 meters) above sea level using a combination of battery power and power generated by hydrogen fuel cells. Then, after reaching the cruise altitude and disconnecting the batteries, Barberan maintained level flight at a speed of about 60 miles per hour (100 kilometers per hour) for 20 minutes on fuel-cell-generated power alone.

A fuel cell is an electrochemical device that converts hydrogen directly into electricity and heat with none of the products of combustion such as carbon dioxide. Other than heat, water is its only exhaust.

With zero carbon dioxide emissions, very low noise levels and an insignificant infrared signature, PEM fuel cell technology has potential for use in powering small manned and unmanned air vehicles for surveillance missions, said Escarti, who indicated that BR&TE will pursue follow-on enabling research in this area.

"Over the longer term, fuel-cell technology could be applied to secondary power-generating systems, such as auxiliary power units for large commercial airplanes," added Jose Enrique Roman, BR&TE's director of Engineering and Programs. He added that Boeing does not envision that fuel cells will ever provide primary power for large commercial airplanes, but the company will continue to investigate the potential of fuel cell technology as well as other alternative fuel and energy sources that improve environmental performance.

Researchers at BR&TE, part of the Boeing Phantom Works R&D unit, have worked closely with researchers in Boeing Commercial Airplanes and a network of partners since 2003 to design, assemble and fly the experimental craft.

After accomplishing its mission to prove that manned flight of a fuel-cell-powered airplane is possible, the BR&TE team said no more flights of the Fuel Cell Demonstrator Airplane are planned. However, plans are being made to display the vehicle at air shows in Berlin and Farnborough, England, this year. ■

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