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Boeing Commercial Airplanes will develop and test an electrically powered demonstrator airplane as part of a study to evaluate environmentally friendly fuel cell technology for future Boeing products.

The airplane manufacturer is working with Boeing's new Research and Technology Center in Madrid, Spain, to modify a small, single-engine airplane by replacing its engine with fuel cells and an electric motor that will turn a conventional propeller.

"This is the first of many advanced technology projects focusing on the protection of the environment to be developed in Madrid," said Miguel Hernan, the Center's director.

Fuel cells and electric motors will not replace jet engines on commercial transports, but they could one day replace gas turbine auxiliary power units. Auxiliary power units, which typically are located in the rear fuselage with exhaust ports through the tail, are coupled to generators and compressors to produce electricity and air for airplane systems while on the ground and for backup use in flight.

"Our ultimate goal is to replace the auxiliary power unit," said Dave Daggett, associate technical fellow in the environmental performance strategy group. "But first, we're going to learn more about fuel cells by powering a small airplane and, as the technology matures, use fuel cells to power an aircraft electrical system, such as the in-flight entertainment system."

Fuel cells are inherently cleaner and quieter than auxiliary power units. They have fewer moving parts and can generate more than twice as much electricity with the same amount of fuel.

A fuel cell is a chemical engine that produces electricity directly through an electro-chemical process. Like a battery, a reaction inside the fuel cell creates direct-current electricity. Unlike a battery, which needs to be recharged, fuel cells keep working as long as the fuel lasts.

"Fuel cells show the promise of one day providing efficient, essentially pollution-free electrical power for commercial airplane primary electrical power needs," Daggett said.

He recently witnessed a demonstration of a hydrogen-fueled automotive fuel cell that was so environmentally friendly its only byproduct was water safe enough to drink.

Most of the work on the electric airplane will be done in Europe. Boeing Madrid will design and integrate the experimental airplane's control system. NASA, fuel cell manufacturers, the automotive industry and several European universities are supporting the project. Test flights are scheduled to begin in early 2004.

"Fuel cells are an exciting new technology that have a wide range of potential applications on future commercial aircraft," said Mike Friend, Chief engineer for New Airplane Product Development. "By adapting this technology for aviation, Boeing intends to demonstrate its leadership in the pursuit of delivering environmentally preferred products."

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