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Innovations from NASA could save airlines billions



Researchers with NASA's Environmentally Responsible Aviation project coordinated wind-tunnel tests of an Active Flow Control system - tiny jets installed on a full-size aircraft vertical tail that blow air - to prove they would provide enough side force and stability that it might someday be possible to design smaller vertical tails that would reduce drag and save fuel. (Dominic Hart/NASA)



By CHELSEA HAR/EY
Special to The Washington Post

NASA research aimed at cutting fuel consumption, pollution and noise from airplanes could pay off for the nation's airlines to the tune of more than \$250 billion dollars, the agency said this week. Green technologies developed by the research project are expected to save billions of gallons of fuel if implemented, cutting carbon emissions and reducing air pollution in the process.

The research was conducted between 2009 and 2015 as a part of NASA's Environmentally Responsible Aviation (ERA) project, which was designed with the purpose of developing and testing new technologies to reduce the impact of aviation on the environment. The overall goal, according to ERA project manager Fay Collier, was to come up with solutions that would improve noise, pollution and carbon output all at the same time, rather than sacrificing one area in order to improve another.

"It was a push to develop integrated solutions that would reduce those goals simultaneously," Collier said. By the time the project concluded, the researchers had completed eight integrated technology demonstrations, which they hope will be further honed and adopted by the private sector in the coming years.

The conclusion of the project comes at a timely point, as there's been a surge of recent interest in and research on the carbon footprint of aircraft. According to the Environmental Protection Agency, aircraft emit 11 percent of all the greenhouse gas emissions from the transportation sector in the U.S. and 3 percent of the country's total greenhouse gas emissions. In 2015, the agency issued a notice including its intent to cooperate with the UN's International Civil Aviation Organization (ICAO) on the creation and adoption of future international carbon dioxide standards for aircraft.

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The ICAO estimates that aircraft account for about 2 percent of all global greenhouse gas emissions and that these emissions are expected to grow by 3 to 4 percent each year as global air travel continues to increase. The European Commission has cited estimates suggesting that aircraft emissions in 2020 will be about 70 percent higher than they were in 2005.

However, reducing their emissions has proven difficult in part because of limits in the ability to power them by alternative means. Although some manufacturers have dabbled in the creation of electric aircraft, the technology is nowhere near the point where it could be practically used. Efforts to reduce the carbon footprint of aircraft has rather been focused on improving aerodynamics and fuel efficiency and, more recently, researching alternative fuels.

In terms of reducing an airplane's carbon footprint, cutting down on the airplane's weight and drag and reducing excess fuel burn in the engine is key, Collier said. To that end, the researchers' demonstrations included designing more efficient engines, incorporating lighter-weight materials in the aircraft and redesigning wings, tails and even fuselages in order to improve the way air flows over the aircraft's body.

One of the NASA-developed technologies is already on its way to becoming commercialized, Collier said. While the project was still being conducted, the agency worked with a Michigan-based company called FlexSys on a new design for the flaps on airplane wings, which would make planes lighter and more aerodynamic, thus saving fuel.

"In December, FlexSys entered into a joint venture with Aviation Partners - they're a supplier to aircraft builders - to take this technology and commercialize it," Collier said. The researchers are hopeful that the other technologies developed by the ERA project will find their way into commercial airlines over the next few years as well.

"The technologies that we've developed in both cases have significant company investment and interest," Collier said. In general, he said any of the technologies developed by NASA are likely to take another five years or so to be honed by manufacturers and made ready for application. But the agency is hopeful that in the next 10 years, each of the ERA innovations will have become integrated into commercial or even military aircraft. That's where the \$250 billion in predicted savings comes in.

"We assumed that by 2025 all of these technologies would find themselves into products and they would be flying in the U.S. fleet," Collier said. "And when we integrated the impact of those technologies over 25 years, that gave us the [\$250 billion]."

The agency calculated the number by projecting how many gallons of fuel would be saved by the new technologies and assuming a price of \$3 per gallon - meaning the new technologies are expected to save more than 80 billion gallons of fuel over 25 years if they were all integrated. NASA has not yet released any information on how much of a reduction those savings would equal in terms of carbon emissions.

The NASA research is a step forward on this front, although the future of the new developments likely falls on the shoulders of industry.

"We take it to a certain technology readiness level," Collier said of NASA's aviation research. "And then it's up to the manufacturer to take it to application."

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