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Award-Winning Fuels Research

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The national Air Force Association has presented its highest award in science and engineering to the Air Force Research Laboratory's alternative fuels team, which includes the University of Dayton Research Institute's Energy and Environmental Engineering division, for its research and development in alternative fuels.

The team also includes chemists, engineers and technicians from AFRL's Propulsion Directorate.

The Theodore von Karman National Aerospace Award was presented Sept. 19 at the AFA annual convention and awards ceremony in Washington, D.C.

Working in tandem with the Commercial Aviation Alternative Fuels Initiative, the team developed a 50/50 blend of conventional and synthetic jet fuel designed for use in military and commercial aircraft and evaluated the blend for suitability and reduced emissions. Their work to assess the fuel's chemical composition, engine performance and compatibility with existing fuel-system infrastructure enabled the American Society of Testing and Materials (ASTM) to publish the specifications for synthetic jet fuel in 2009. These guidelines provide for the production, distribution and use of aviation turbine-engine fuel blends produced from coal, natural gas or biomass in commercial aircraft.

Building on their successes in synfuel research, the team developed and evaluated a biofuel blend that became the first aviation biofuel approved by the ASTM. Biofuel sources can include camelina, palm, soy and algae oils and other renewable biological stock and, like synthetic fuels, are designed to burn more efficiently and produce fewer emissions.

"Now that the fuel specifications are modified and approved, refineries can produce these fuels for aviation use and the airlines and Air Force can buy them," said Tim Edwards, a senior chemical engineer in AFRL's Fuels Branch. "This research is helping enable a new industry to help reduce our dependence on imported petroleum."

The development of synthetic and bio-based alternative fuels is "game-changing" and marks the third time in aviation history fuel specifications have been dramatically altered, said Dilip Ballal, head of the Research Institute's Energy and Environmental Engineering Division and director of the University's von Ohain Fuels and Combustion Center. The first modern aviation fuel standard was specified in 1951 for JP-4 fuel, which was being used in large quantities, Ballal said.

"But these fuels burned much like gasoline, which made them dangerous. If a plane crashed, the fuel would catch fire and destroy more of the aircraft than the crash did," Ballal said.

That led to the development and specification of JP-8 fuel, which was far less volatile, in the late 1980s, Ballal added.

"The von Karman award underscores the significance of the Alternative Fuels Team's groundbreaking work in advanced fuels and this historic time in aviation fuel history," Ballal said.

The von Karman national aerospace award is named after the late aeronautical scientist and engineer Theodore von Karman, who in 1945 was appointed the first chairman of the U.S. Air Force Scientific Advisory Board and was the inaugural recipient of the National Medal of Science, presented by President John F. Kennedy in 1963.

The Air Force Association is an independent, nonprofit civilian education organization dedicated to promoting public understanding of aerospace power and the pivotal role it plays in the security of the nation.

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