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## **Boats With Wings: Cedarville Grad's Hydrofoil Research Wins Award**

**CEDARVILLE, OHIO** -- Sometimes while problem-solving, engineers may have to "wing it" — and for one recent Cedarville University graduate, "winging it" resulted in a great victory.

Jason Paulus, a 2021 mechanical engineering graduate from Colorado Springs, Colorado, received first prize and a \$2,500 award for his paper "A Multi-Input Control Model for a Hydrofoil Boat with Differential Front & Rear Strut Steering and Actuated-Wing-Induced Roll" in the 2021 Mandles Prize for Hydrofoil Excellence, sponsored by the International Hydrofoil Society (IHS).

Hydrofoil technology focuses on the application of lifting surfaces that operate in water. In aviation, the cross section of the wing surface is called an airfoil, but underwater, it is known as a hydrofoil.

"Most boats rest with their hull in the water, but in the field of hydrofoil engineering, you take 'wings' and put them on struts coming out of the bottom of the boat," Paulus explained. "This allows the craft to gain lift, raise the hull out of the water, increase maneuverability and speed, and reduce drag."

[The Solar Splash competition](#) that Paulus and the rest of Cedarville's solar boat team attended in early June requires teams to optimize their boat's energy use, so a hydrofoil design's lower drag would be a strong benefit.

While Paulus worked alongside the solar boat team preparing for the competition, his award-winning paper was independently authored. The team's work, which focused on upgrading and preparing their existing boat for competition, varied from Paulus' paper, which focused on the feasibility of an automatic flight control system for a future design.

"Back in 2017, a team from the Netherlands published an article where they showed a math model that described how their boat operated, and they tested with their boat to validate the model," Paulus said. "We only have a conventional boat currently, but I did research and theoretical work and developed a math-modeled computer program that could control the 'wings' on a boat like ours, mirroring the work that the Netherland's team did."

Under the mentorship of [Dr. Timothy Dewhurst](#), senior professor of mechanical engineering, Paulus conducted his research as the focus of his senior design capstone.

Paulus' research could allow a specially designed boat with wings on inline struts to fly on the water and balance upright like a bicycle with minimal input from the pilot. His report laid out the background of related research, the established mathematical model, and how his work adds to existing scholarship.

As Paulus looks ahead, having recently graduated and soon entering the workforce, he is grateful for all the knowledge and experience he gained from the solar boat team and his related research.

“I grew a lot as an engineer because before this project, my learning was guided by professors and textbooks,” Paulus noted. “With this project, I spearheaded my own research, self-learned and became more prepared for an actual job in industry.”

Located in southwest Ohio, Cedarville University is an accredited, Christ-centered, Baptist institution with an enrollment of 4,550 undergraduate, graduate, and online students in more than 150 areas of study. Founded in 1887, Cedarville is one of the largest private universities in Ohio, recognized nationally for its authentic Christian community, rigorous academic programs, including the [Bachelor of Science in Mechanical Engineering](#) program, strong graduation, and retention rates, accredited professional and health science offerings, and high student engagement ranking. For more information about the University, visit [www.cedarville.edu](http://www.cedarville.edu).

Written by Heidie Raine