Willie Evans

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BIOGRAPHY

During Willie Evans' freshman year of high school, his very first chemistry teacher gave them an assignment to blow up a piece of sodium metal during lab. While the experiment was easy, it was super exciting. That experiment was the beginning of his journey in science and mathematics, which led him to where he is today. Willie knew he wanted to learn more about such reactions and pursue a career in creating materials that would hopefully make the world more efficient. As he applied for college, he was awarded and accepted a scholarship to play NCAA Division II college lacrosse at Tusculum College, a small private school in his home state of Tennessee where he studied chemistry. Since it was such a small school, he felt the program didn't offer him what he needed to maximize his full potential in the field of chemistry, so he decided to transfer to the University of Arkansas as a sophomore. Willie felt that the University of Arkansas offered more opportunities in the field of research for him to optimize his potential in science. While working on fuel cells in lab, he solidified his interest in alternative energy sources. Collaborations in his research with brilliant professors in the chemistry, physics, and engineering departments, as well as his experience at the Pacific Northwest National Laboratory steered him in the direction to not only pursue a degree in chemistry, but also obtain a minor in physics and nanotechnology. He has seen how technology has evolved, and has grown particularly interested in aeronautical and aerospace applications of materials.

RESEARCH

High-speed aircraft propulsion requires efficient operation of all engine components including the inlet, fan, compressor, combustor, turbine, and nozzle. The engine inlet slows and pressurizes the incoming air before the fan and compressor sections additionally increase the pressure in preparation for the combustion process. The turbine section extracts energy from the gas stream to power the fan and compressor, and the nozzle adjusts its shape to optimize engine thrust. If the speed is high enough, a series of shock waves develop in the inlet which cause highly three dimensional and unsteady flow which then propagates downstream into the engine and causes increased fuel consumption, increased stress on engine components, and decreased engine service life. As experimental testing of these flows is very expensive, computational simulations are critical to understanding the detailed fluid dynamics of each component in a cost-effective manner. In using an experimental wind tunnel, simulated inlet shock fields of the air at 2-3 times the speed of sound can be studied and compared using the schlieren imaging technique. This method is a visual process commonly utilized to envisage the flow of air as well as subsequent shock waves created around an aircraft. Here at Saint Louis University, we have collaboratively studied shock wave flow physics occurring in supersonic engine inlets with distinguished names in the field of shockwave boundary layer interaction (SBLI). Understanding the transition from laminar to turbulent boundary layers is critical for the correlation of mathematical predictions from computational fluid dynamics (CFD) and data gathered from the simulated wind tunnel testing.