Richard Lee Hollenbach III

Personal Biography

We live in a time where people heavily rely on air travel for work, visiting family, and exploring the wider world. However, the engines used to power these airplanes can experience aerodynamic instabilities (flutter and separated flow), endangering passengers and pilots every day. I want to ensure the safety of all jet engines; thus, I am pursuing my doctoral degree in mechanical engineering specializing in aerodynamics and fluid-structure interaction. Afterwards I plan to be a research leader at a national laboratory, working to maintain the United States' aerospace safety, efficiency, and dominance.

Pursuing a Bachelor of Science Degree in Mechanical Engineering, I spent four years at the University of Pittsburgh. To supplement my degree, I also pursued minors in Mathematics and German, as well as a certificate in Applied Simulation in Design. Multiple internships and research experiences developed my research and other technical skills. Outside the classroom I served as a resident assistant to first year engineering students, accepted positions within multiple honor societies including engineering, leadership, and scientific research, and even served on the student government board. These outside positions really honed my "soft" skills, such as public speaking, team management, and more. Overall, my undergraduate experience greatly prepared me for graduate school and beyond.

I first desired my Ph.D. while interning at the Naval Nuclear Laboratory. My mentors had doctorate degrees and applied their research skills to difficult problems. What interested me most was the level of independence in leading the projects. Thus, I decided to pursue a Ph.D. myself; the first step was to conduct aerospace research myself. During a summer at Texas A&M University, I designed and tested a laser spectrometer for plasma diagnostics used in hypersonic wind tunnel experiments. Building my own test rigs honed my engineering creativity; working with wind tunnels solidified my interest in aerodynamics. Later, a summer at Rolls-Royce greatly improved my aeromechanics knowledge. I performed high-level engine simulations to search for engine failure causing aerodynamic instabilities such as flutter and forced response, then developed designs to overcome them. These experiences taught me the value of utilizing both computational and experimental approaches to solve complex aerospace problems, which I employ towards earning my doctoral degree.

I chose to attend Duke University for its world-renowned aeroelasticity research program as well as its leadership in the GUIDE Consortium. Collaborating with expert faculty in this field will prepare me to conduct cutting-edge research; the consortium gives me access to resources from turbomachinery governmental laboratories and companies such as NASA and Pratt & Whitney. I study fluid-structure interaction in turbomachinery, specifically Non-Synchronous Vibrations (NSV); this phenomenon is much less understood compared to flutter or forced response which have current design tools. To fully comprehend NSV, I am conducting both experiments and simulations to measure the unsteady pressures guiding the aerodynamic behavior.

Starting with a simple configuration and increasing in complexity, I am studying a single airfoil, then a linear cascade of seven airfoils, and finally a full-annulus three stage turbine, utilizing facilities at Duke and Germany. At this time, studies on the single airfoil have already begun, with each configuration expected to take a year. Throughout this project I will present my results at conferences such as Turbo Expo and Global Power and Propulsion Society through papers and posters.

This scholarship will allow me to focus solely on my research, rather than simultaneously working at my other jobs such as a teaching assistant. With the completion of my degree, I will be able to immediately assist national laboratories in the design and testing of large-scale aerospace projects. I truly value my education, and how my multiple degrees will propel me into a position where I can work on the most cutting-edge aerospace projects in the world.

To learn more about me and my interests, feel free to visit my webpage (http://people.duke.edu/~rlh55/) or contact me at rlh55@duke.edu. I am available at any time to answer questions.