Computational Fluid Dynamic Analysis of a Diamond Airfoil in an Effort to Study Hypersonic Fluid-Thermal-Structure Interaction at Sea Level  
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Location: 362 Willard Building  
Coffee and donuts will be provided

Abstract: The development of hypersonic aircraft, rocketry, and missiles creates a set of complex phenomena and engineering problems. Different characteristics appear in the flow fields at hypersonic speeds than those at supersonic speeds and need to be addressed accordingly. Extreme temperatures cause molecular excitation and conjugate heat transfer within the boundary layer. Exceedingly strong shock waves are also seen within the flow field.

This presentation explores computational grid refinement for strong shock cases, specifically high density, sea level input conditions, to compare to theoretical results. To alleviate artificial diffusion and other numerical error, found at the sharp corner of the midchord of a traditional two dimensional diamond airfoil, the midchord was rounded. This allowed for the flow to gradually expand across the back surface of the geometry eliminating the sharp discontinuities. Further investigations were conducted for various angle of attacks and compared to results within the literature. The numerical computations discussed are part of an effort to explore the phenomena of hypersonic fluid-thermal-structure interaction including dissociation effects at sea level inflow conditions. The importance of this work is discussed as well as the author's research efforts.

Biography: Erika Lieberknecht is an aerospace engineer at the Naval Surface Warfare Center in Dahlgren. She received her BS and MS degrees in Aerospace Engineering at Penn State. She is currently pursuing her PhD at Virginia Tech.