

1. **Research Title:** Efficient Feature Parameterization for Model-based Ultrasonic Characterization of Composite Damage

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level**

Topology Optimization/Applied Mathematics (MS or PhD level)

4. **Objectives:** Select and apply a method to parameterize composite impact delaminations. Develop a model to simulate the ultrasonic inspection of impact delaminations within a representative composite material using Abaqus or COMSOL. Using sensitivities generated from the model, determine a low dimensionality representation (LDR) of the example delamination field. Test the optimized LDR on a sample inverse problem leveraging available high performance computing (HPC) resources.
5. **Description:** Nondestructive characterization of impact damage within composite materials is a critical step towards improving the sustainability of the Air Force fleet. Characterization requires the solution of the inverse problem, where the ultrasonic response from damage within the composite are interpreted as geometric features. To successfully solve this problem, a reliable method of representing the impact damage parametrically is required. The goal of this project is to identify an efficient and robust representation of composite damage, specifically the delamination "field" that results from impact.
6. **Research Classification/Restrictions:** None
7. **Eligible Research Institutions:** AFIT, The Ohio State University, Wright State University, The University of Dayton