1. **Research Title:** Advancing Metals Performance Through Synchrotron Beamline Data

2. **Individual Sponsor:**

Dr. Paul Shade (AFRL/RXNM)
Materials & Manufacturing Directorate 2230
10th St, Bldg 655, Rm 125A
Wright-Patterson AFB, OH
45433 937-255-3130
paul.shade.1@us.af.mil

3. **Academic Area/Field and Education Level:** Materials Science & Engineering, Mechanical Engineering, Computer Science, Applied Math, Solid State Physics, Related Field (MS or PhD level)

4. **Objectives:** Development of novel experimental and computational approaches which enhance workflows that leverage synchrotron x-ray data to support metals performance prediction efforts

5. **Description:** Research techniques available at multi-$B synchrotron facilities offer cutting edge technology for characterizing metals performance. This includes non-destructive, spatially resolved evaluation of residual stress as well as in situ experiments that capture the evolution of microstructure and mechanical state in a material during a concurrent process such as mechanical testing. Our objective is to make this technology accessible to the DoD ecosystem through maturing the measurement techniques as well as the transition pathways into metals performance modeling efforts such as fatigue lifetime prediction. We are interested in research to improve the fidelity and efficiency of synchrotron beamline data collection and analysis. Related approaches, such as transitioning synchrotron beamline techniques to laboratory x-ray sources and complementary neutron beamline or electron microscopy studies are also of interest. We are also interested in metals performance modeling efforts that leverage synchrotron beamline data as an input.

6. **Research Classification/Restrictions:** This research topic is unclassified basic research eligible for publication in the open literature. Limited to students that are U.S. Citizens.

7. **Eligible Research Institutions:** All DAGSI Institutions

8. **PA Approval #:** AFRL-2024-3256