

## DAGSI Research Topic

1. **Research Title:** Characterization of microstructure and damage of high temperature ceramic matrix composites for aerospace applications

2. **Individual Sponsor:**

Dr. Katie Detwiler, AFRL/RXNC  
AFRL/RXNC  
2230 Tenth Street  
WPAFB, OH 45433  
[kaitlin.detwiler.4@us.af.mil](mailto:kaitlin.detwiler.4@us.af.mil)

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

Materials Engineering, Mechanical Engineering, Aerospace Engineering, Electrical Engineering and/or Computer Science or related (BA/BS, MS or PhD level)

4. **Objectives:** The objectives of this program are to:

- a. Utilize imaging techniques (optical, SEM, XCT) to characterize composite microstructure
- b. Utilize imaging techniques (optical, SEM, XCT) to characterize damage in composite microstructure during mechanical testing
- c. Employ damage models to describe composite performance

5. **Description:** The Air Force is interested in ceramic matrix composites (CMCs) for high-temperature jet engine applications. CMC properties and performance can be linked back to material processing and resultant microstructure. Specifically, in continuous fiber-reinforced composite materials, metrics such as fiber architecture, content, and spacing will affect the mechanical behavior of the composite. Applied load to the CMC will result in micro-cracking that deflects around fibers. Micro-crack opening displacement and spacing are used in CMC damage models to predict CMC lifetimes. In-situ imaging paired with mechanical testing can provide insight on these damage mechanisms.

6. **Research Classification/Restrictions:** U.S. citizenship required.

7. **Eligible Research Institutions:** This is open to all accredited academic institutions

**NOTE: Topics submitted to DAGSI must be approved for public release. Need PA Approval #**

1. **PA Approval Number: AFRL-2023-4388**