

DAGSI Research Topic (New)

1. Research Title:

Fatigue Performance of Additive Manufacturing PMCs

2. Individual Sponsor:

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3. Academic Area/Field and Education Level:

Related Engineering Degree, Physics, Applied Math
Additive Manufacturing, Fatigue
(MS or PhD Level)

4. Objectives:

Explore advance state-of-the-art methodologies in assessing fatigue performance in additive manufacturing (3D printing) polymer matrix composites.

5. Description:

Additive Manufacturing (AM) has been a game changing technology that has expanded the design space for several applications. Although advanced topology optimization techniques have been explored to enhance a component's structural performance under static conditions, they have not been successfully applied to fatigue. Understanding fatigue performance of composite materials allows designers to determine the life cycle of aircraft components, which is critical for maintenance. Ultimately, AFRL seeks to develop both the knowledge and methodologies required to understand the fatigue performance of AM discontinuous or continuous carbon fiber composites. Size relationships of various printing processes strongly influence how the material is going to perform. A size effects study needs to be conducted to properly vet life prediction, inspection thresholds, and ultimately performance if AM components will inevitably be used in aircraft. A size effect study would help narrow down the fatigue spectrum of interest potentially reducing later cost of components. This fatigue analysis will require design-of-experiments methodologies that identifies potential size effects, critical flaw sizes, damage initiation and propagation for any aircraft structural component.

6. Research Classification/Restrictions:

Unclassified research. Eligible for Public Release. Open to U.S. Citizens Only.

7. Eligible Research Institutions:

All DAGSI Institutions