



SEEDING THE FUTURE

Rapid, Low-Cost Material Qualification For High Cycle Durability Of Short-Lived Turbine Engines

SMART AND FAST:
NEW TECH SPEEDS
HCF QUALIFICATION
OF NEW MATERIALS

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SBIR COMPANY NAME:
FRACTURELAB, LLC

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AFRL/RXKMS

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ORGANIZATION: AFRL/
RXKMS

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Photo by Joseph Mather

THE BASICS

- A fatigue testing rig that is between twenty-five and one thousand times faster than conventional testing methods.
- A new way to expand the limited testing for a rapid and broader assessment of the structural suitability of the material.
- Analysis of the testing allows for greater material utility.

NEW HIGH CYCLE FATIGUE (HCF) TESTING TECHNOLOGY WILL ALLOW AEROSPACE BUILDING MATERIALS TO BE VETTED MORE QUICKLY AND EFFICIENTLY FOR FUTURE USE, AND WITH MUCH MORE INFORMATION GATHERED DURING THE TESTING PROCESS.

With the support of SBIR/STTR, Utah-based FractureLab has developed a fatigue testing rig that is between twenty-five and one thousand times faster than conventional testing methods, depending on the material.

This method, merged with analysis of these experiments, is a new way to expand the limited testing for a rapid and broader assessment of the structural suitability of the material.

Aerospace materials can now reach the required billion fatigue cycles within just over two weeks, and the analysis of the testing allows for greater material utility.

Because of the success of this project, FractureLab has gained access to more outside interest in their technologies, and continues to grow their portfolio of testing technologies and engineering solutions.

FractureLab hopes to continue expanding their testing technologies and providing structural integrity testing and analysis in other areas of the market.

BEHIND THE TECHNOLOGY

High cycle fatigue testing is used to test how a material weathers after extensive use, and is necessary in aerospace engineering for the safety of the warfighter and the reliability of equipment.

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The problem is that fatigue material testing is a costly and time-consuming endeavor, which can be prohibitive enough that certain materials are never considered for use. This limiting factor is a barrier to technology with otherwise compelling benefits.

The Air Force needed a testing method that would give them the information about these materials, without the significant associated costs.

FractureLab created a testing rig that is inexpensive, and performs the necessary testing in a fraction of the time, which opens up a world of possibilities for materials in aerospace engineering by providing information on its structural integrity.

This technology was created by using a miniature electric rig to continuously run compliance monitoring software at high testing speeds, many times faster than conventional testing methods.

With analysis of the results, a physically based method was developed that extends the experimental data base to a wider number of loading conditions.

FractureLab is currently working with an Air Force vendor to evaluate the new system for the enhancement of existing systems.

SBIR FUNDING AND AFRL'S EXPERTISE WERE CRITICAL

The contribution from SBIR funding and AFRL expertise was essential in the development of the project.

Entering into the project, FractureLab had created a prototype that could run at 100 Hz, which was between 3-5 times faster than conventional testing. SBIR funding allowed the finished project to increase to run continuously at 750 Hz.

In addition to increasing the speed of the test, AFRL expertise allowed FractureLab to look into the fatigue testing approach, so that they could gather more information from each test and minimize the number of hours needed. This represents a significant cost savings for the Air Force, in addition to the time saved.

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