

SEEDING THE FUTURE

# Rapid, Local Characterization of the Fatigue Growth Crack Behavior

## SOLID STATE POWER AMPLIFIER THERMAL MANAGEMENT

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SBIR COMPANY NAME: FRACTURELAB,  
LLC

TECHNICAL PROJECT OFFICE: AFRL/  
RXCM

SPONSORING ORGANIZATION: USAF/  
AFMC, AFRL/RQKMC

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## THE BASICS

- Revolutionary technology measures the impact of flaws in titanium that are submillimeter in lengths
- Allows both equipment manufacturers and Air Force users to track weaknesses in their titanium before it ever becomes a major problem
- A host of tools for local crack data and modeling



Photo by Capt. Kip Sumner.

## SOLVING BIG PROBLEMS WHEN THEY START SMALL

With the support of Air Force SBIR/STTR, Utah-based FractureLab has pioneered laboratory techniques and simulation software that gathers data to understand the mechanisms of microstructural crack growth in aerospace metals like titanium.

With this development, aerospace materials can be more thoroughly vetted for flaws, and engineers can better estimate the material integrity of existing aircraft without relying on more expensive diagnostic equipment.

This accomplishment has netted the company a modest amount of sales, but it hopes to use the potential spin-offs of the project to dramatically increase the value of all other projects in the future.

The success of this project has established FractureLab in the industry, and it hopes to continue to grow in the market as a result.

## BEHIND THE TECHNOLOGY

The integrity of aerospace materials is often an essential part of the life of an aircraft. Materials like titanium are chosen for their strength and durability, but can have flaws that equipment manufacturers need to take into account in design.

Even after the aircraft components are created, testing can be expensive and difficult because there was not an effective way to measure minor flaws in titanium – flaws which turn into major failures over the course of years of use and wear.

FractureLab's revolutionary technology measures the impact of flaws in titanium that are submillimeter in length. This allows both equipment manufacturers and Air Force users to track weaknesses in their titanium before it ever becomes a major problem.

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By use of fracture simulation software and crack front marking hardware, FractureLab is able to provide a host of tools for local crack data and modeling, which gives the user the information they need on the titanium's integrity.

These methods have been adopted at the Worcester Polytechnic Institute and a private commercial lab, and other laboratories are interested in the project as it develops.

### **SBIR FUNDING AND AFRL'S EXPERTISE WERE CRITICAL**

Air Force SBIR and AFRL funding and expertise were essential in the development of the crack diagnostic technology.

"While the crack tip marking method was conceived and demonstrated in a primitive fashion prior to SBIR funding," the FractureLab team said, "considerable effort was necessary to bring the technology to its current capability, which would not have been possible without it."

Between the Phase I and Phase II contracts, \$1,024,950 were invested by Air Force SBIR. The technology is now in use at several private laboratories, and interest in the project continues to grow. 🔄

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