

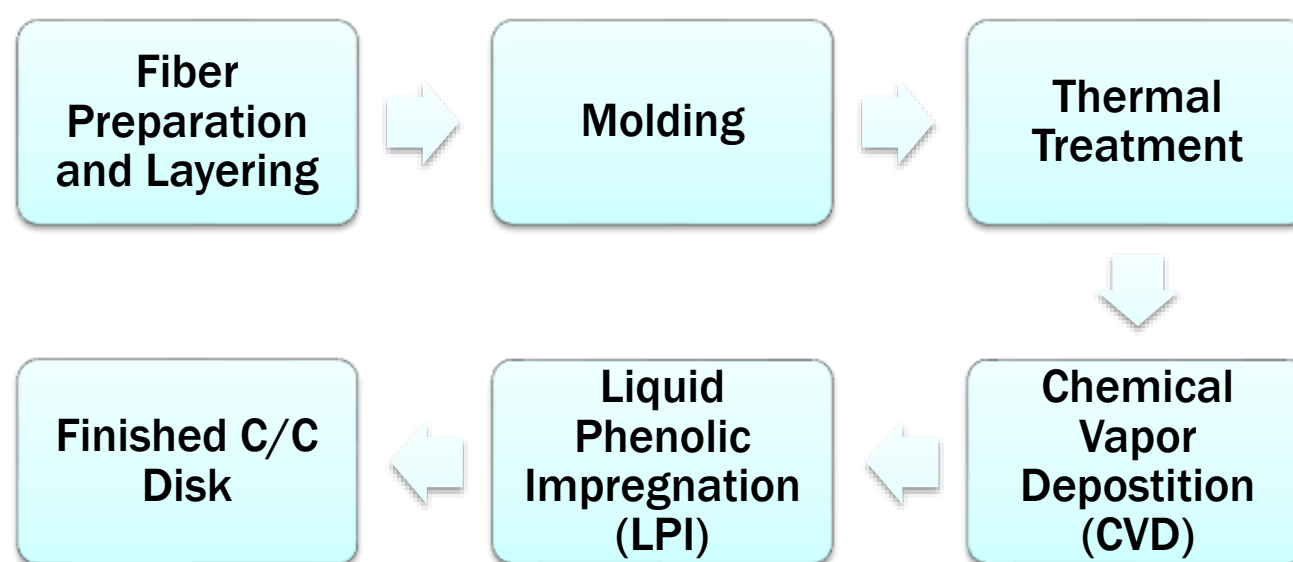
Non-Destructive Evaluation of Composite Materials

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Abstract

Carbon composite materials are essential to the safety and efficiency of many aircraft. Due to their superiority to metals in thermal conductivity, high strength, and low weight they have become one of the most popular materials used in the aerospace industry. Producing carbon composites materials, such as Carbon/Carbon (C/C) composite disks and carbon fiber reinforced plastics (CFRP) panels, requires a large amount of time and money. In order to evaluate these materials alternative methods must be used to test if the composites have the durability and strength to perform their desired tasks without causing damage to the samples. This is why non-destructive evaluation (NDE) techniques must be used to find defects in the materials and evaluate their mechanical properties.

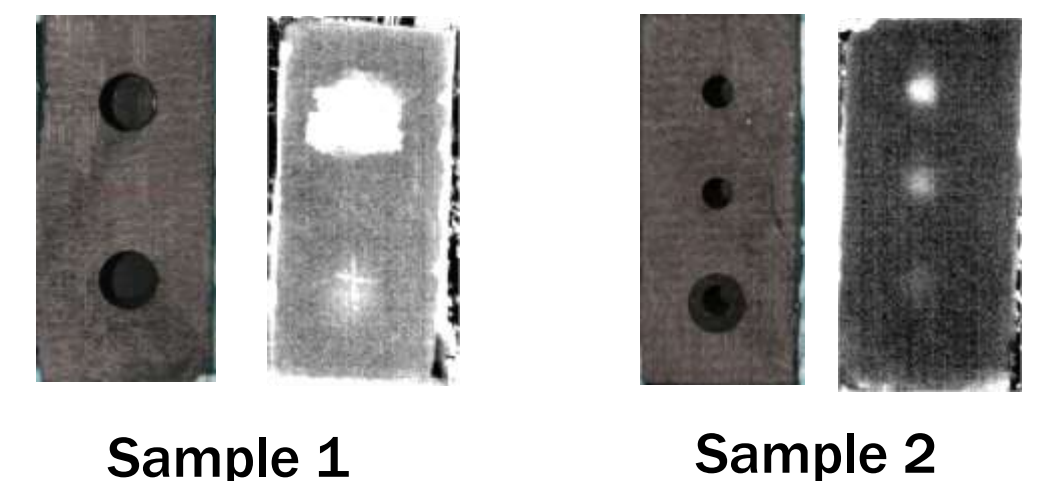
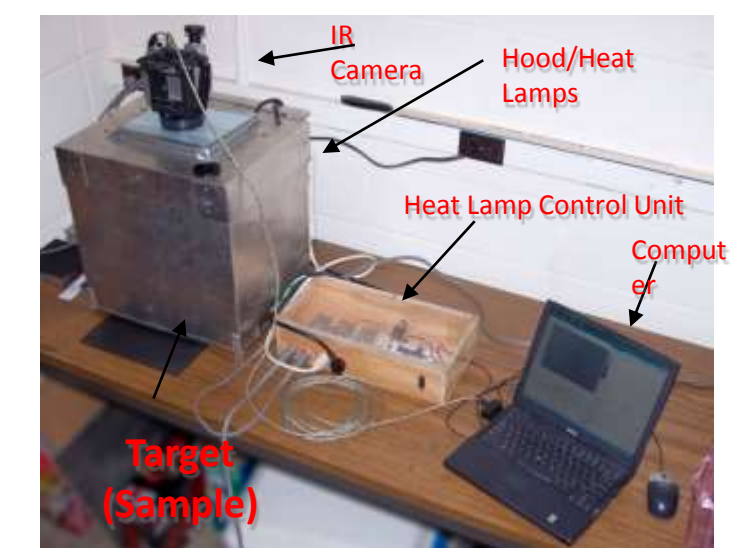
Carbon Composites Production



Mechanical Properties Standards

- Must be able to take in and dissipate up to 450 million Joules
- Operate under heat of more than 3000 degrees Celsius
- Four times lighter than brake disks of other materials

Infrared Thermography

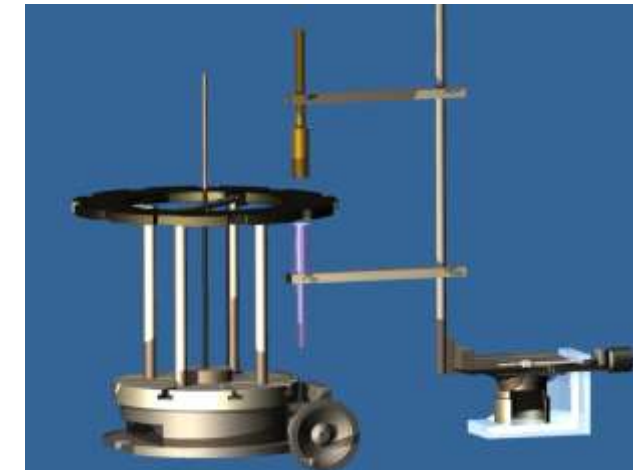


Ultrasonic Testing

Immersion Ultrasound




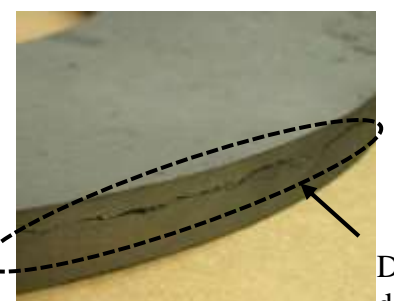


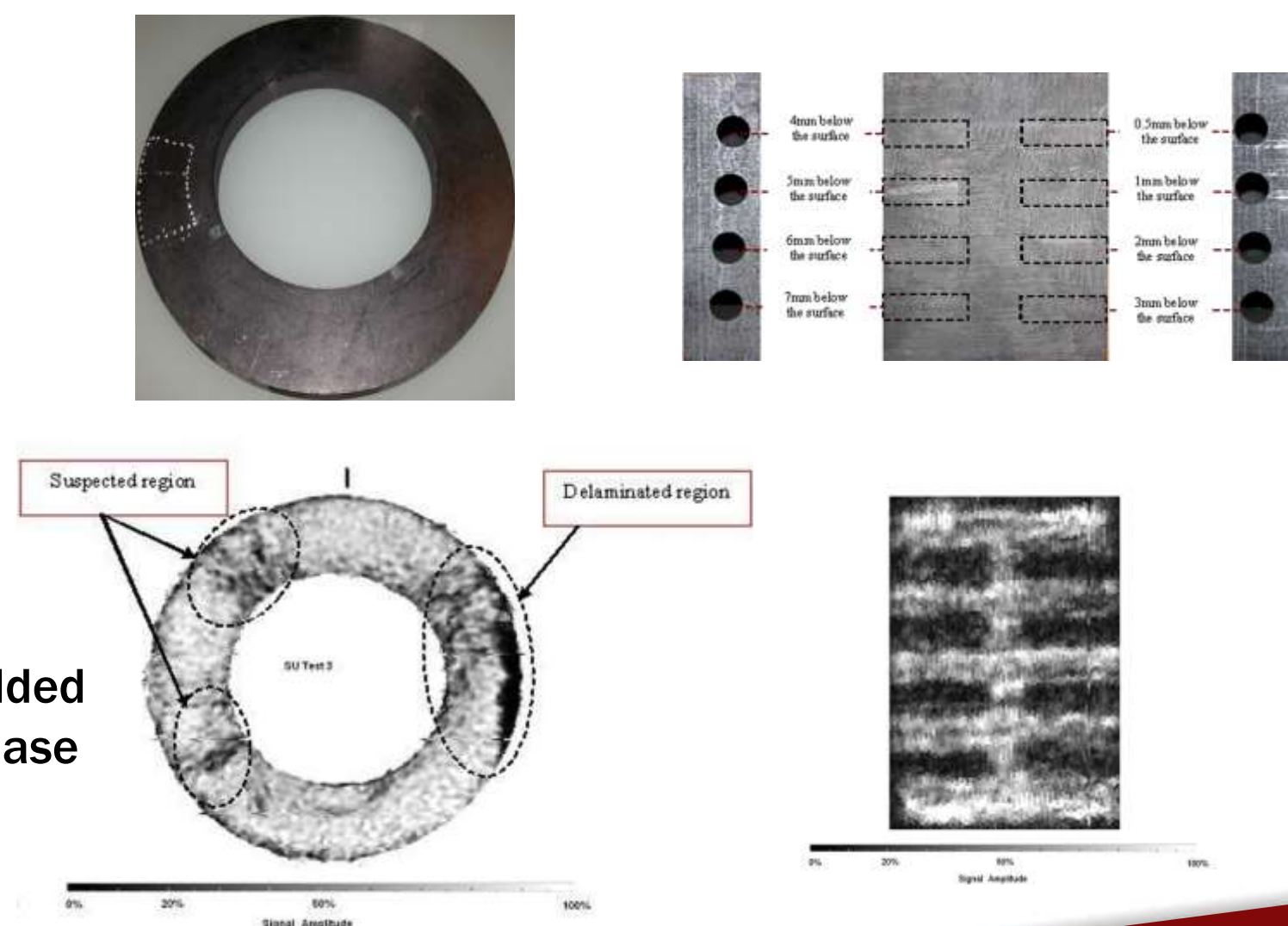
Air-coupled Ultrasound



Defects

3 Common Types of Defects in C/C Composite Disks

- Porosity
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- Delaminations
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- Foreign Object Inclusion
 - Occurs when foreign objects become embedded into the C/C matrix during the production phase making the carbon composites weak



Conclusions

Carbon composites have become essential to the performance of aircraft. Its rise to popularity has called for alternative methods to inspect the material without causing harm or damage. The listed three non-destructive evaluation techniques have become essential to the up keep of these carbon materials and therefore the overall safety of aircraft.

Acknowledgements

- Wood, K. (2007). Friction products: carbon fiber stopping power. *High-Performance Composites*
- Richard A. Miller
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