COMPOSITE MATERIAL FIRE DAMAGE IN CONFINED AIRCRAFT SPACES

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The first decade of the 21st Century has seen a transformation in the structural materials used to construct both commercial and military aircraft. Carbon fiber, polymer matrix composites and hybrids have replaced traditional metal structures in a broad range of aircraft applications. Unfortunately, this change has resulted in the unintended consequence of potentially greater hazards from relatively small, accidental fires on the ground during maintenance and preflight operations. The Air Force Fire and Emergency Services organizations have asked the Air Force Research Laboratory to develop a hazard assessment based on experiment and modeling to provide information for fire emergency response planning.

This hazard assessment requires three distinct activities:

1. Experimentally determine damage to composite materials as a function of exposure time and fire size.
2. Develop and validate a model of composite damage as a function of exposure time and fire size.
3. Validate compartment fire model to predict heat flux at material surface.

This paper will report the results of these activities for three critical aerospace composite compositions: Epoxy 977-3/IM7, BMI RM3002 /IM7, Polyimide AFRPE-4/IM7.