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Title: Examining the effects of fixant solution on the fractographic evidence of fire and impact damaged aerospace composites

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The increased popularity and use of composite materials in modern aerospace vehicle structures has led to unprecedented weight savings and performance improvements. However, as the aerospace industry continues to focus on pushing the performance envelope of composite materials, the techniques and protocols pertaining to the failure analysis of aerospace composite materials also need to evolve. One of the scenarios where failure analysis plays a vital role is during an aircraft accident investigation, which is crucial for the continuous improvement of aviation safety. Nonetheless, composites present additional hazards and characteristics that need to be considered at aircraft accident sites, both for safety and evidence preservation. This is especially true when dealing with composites that suffered fire damage from a crash. To prevent the release of potentially toxic gases and fibers from burning composites and thus to protect the personnel involved, protocols call for the application of a fixant solution at aircraft accident sites where composite materials are present. While fixant solutions are critical to control health hazards, researchers have identified the risk of these chemicals compromising the investigation process by contaminating and masking fractographic features that may be indicators of the failure causes. Therefore, the effect of wetted water, a common type of fixant solution, on fire and impact damaged carbon fiber samples was investigated. To induce the impact damage–and replicate an aircraft accident–a [0]8 carbon fiber samples was impacted in accordance with ASTM standard D7136. After sectioning, Scanning Electron Microscopy (SEM) was used to collect fractographic data and analyze the damage features pre and post fixant application. With the findings of this study, a better understanding of the impact of fixant solutions on the failure analysis process was presented, while simultaneously highlighting the importance of adapting exiting protocols to new generation composite aircraft.

Biography

Peng Hao Wang is currently an Assistant Professor at Purdue University's Polytechnic Institute, School of Aviation and Transportation Technology. He graduated from Purdue University with his bachelor, masters and PhD degree in 2013. His research interests focus on composite material life cycle, including the design, testing, manufacturing, repair and recycling of composite materials. He is also a certificated FAA Airframe and Powerplant mechanic with prior experiences working as a line mechanic in the airline industry. His experiences comprises of airline maintenance, aircraft safety, composite design and testing, composite manufacturing, composite repair and composite recycling.