

Induction Thermography of Composite Aircraft Wing Structures for Detection of Disbond at Polymer-Metal Interfaces

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In aircraft wing structures, there can be a relatively thin (~ 1 mm thick) insulating coating (carbon fibre reinforced polymer, CFRP) on a metallic substrate, which is either solid or honeycomb. The integrity of the interface between these two layers is critical for flight safety. The continuity of the interface can be investigated using thermographic techniques. Flash thermography imposes heat from the outside, requiring it to diffuse into the structure. This can produce challenges when the surface is curved or painted, as these conditions can affect the even deposition of energy. An alternative approach is to use induction heating to heat the underlying metal directly and let the heat flow out through the insulating layer. This approach lends itself well to continuously scanning large areas. The use of an inexpensive easily deployed system is demonstrated on both a polymer over Ti-6Al-4V alloy sample, representative of the inner wing stepped lap joint on the F-18 and on a polymer over aluminum honeycomb sample representative of many aircraft control surfaces. In addition to using an infrared camera, the use of liquid crystal sheets, which convert temperature into colour, is demonstrated. The latter approach allows the use of a cell phone camera to pick up the image information.