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Thermographic Tests of Curved GFRP Structures with Delaminations: Numerical Modelling vs. Experimental Validation

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Abstract : The present work is devoted to thermographic studies of curved composite panels (unidirectional GFRP) with subsurface defects. Various artificial defects, created by inserting PTFE stripe between individual layers of a laminate during manufacturing stage are studied. The analysis is conducted both with the use finite element method and experiments. To simulate transient heat transfer in 3D model with embedded various defect sizes, the ANSYS package is used. Pulsed Thermography combined with optical excitation source provides good results for flat surfaces. Composite structures are mostly used in complex components, e.g., pipes, corners and stiffeners. Local decrease of mechanical properties in these regions can have significant influence on strength decrease of the entire structure. Application of active procedures of thermography to defect detection and evaluation in this type of elements seems to be more appropriate that other NDT techniques. Nevertheless, there are various uncertainties connected with correct interpretation of acquired data. In this paper, important factors concerning Infrared Thermography measurements of curved surfaces in the form of cylindrical panels are considered. In addition, temperature effects on the surface resulting from complex geometry and embedded and real defect are also presented.

Keywords : active thermography, composite, curved structures, defects
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