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Damage Detection by Load Path Changes in Reinforced Composite Panels Using Local FBGS and Distributed Sensing

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A SHM technique based on the load path changes has been used to identify debondings in two blades stiffened space grade composite panels. These panels have been instrumented with Fiber Bragg Gratings Sensors, FBGS. The egress of the optical fiber from these panels was made in one panel with pig tails and in the other with embedded optical connectors. Additionally to the local FBGSs, distributed sensors based on the Rayleigh backscattering effect have been embedded in the skin of the second panel. This sensor technique assesses the strains along the entire optical fiber length not only in the stiffeners but also in the skin of the panel. Both techniques have been compared during compression tests of the panels and their ability to detect damage has been evaluated.

Very good agreement has been obtained between strain measures of local and distributed sensing. The distributed sensing technique enables to asses the load path changes very detailed in a global strain mapping of the entire structure, identifying stiffener breakage, skin/stiffener debonding and buckling effects. The distributed sensing has demonstrated its high potential for damage detection of stiffened panels made by fiber placement technology using the load path change assessment.

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