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U. Berger

Onboard - SHM for Life Time Prediction and Damage Detection on Aircraft Structure Using Fibre Optical Sensor and LAMB Wave Technology

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The fatigue of aircraft structures can be monitored by permanently recording strains, which result from the exposure of such structures to various types of loading throughout their usage. From these recordings it is possible to evaluate strain spectra, which may be used to calculate the qualified fatigue life consumed by the structure at a particular point within its service life.

A different approach to monitoring fatigue of aircraft structures is to identify the initiation of small fatigue cracks in service. The fatigue life estimation in such a case is only possible with respect to the macroscopic crack growth.

The use of fibre optical sensors enables the monitoring of strains as required for the first of the above mentioned methods. The use of piezoceramic sensors enables the excitation and measurement of plate waves (LAMB waves) as required for the damage detection.

In this article the use of both these types of sensors on the fatigue test of an aircraft structural component is described. It will be demonstrated that the process of fatigue can be observed very well using fibre optical sensors, which also allows a precise conclusion to be drawn regarding fatigue life consumption.

Furthermore the potential of LAMB wave sensors to detect fatigue damage and monitor macroscopic crack growth is demonstrated. The simultaneous use of both technologies on the same test made a comparison possible and the relative strengths and weaknesses could be identified.

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Ключевые слова:

Содержание

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SHM using fibre optical sensors
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