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Validation of Acoustic Emission on Demand Algorithm for Impact Damage Quantification on Large Aircraft Panels By Environmental and Flight Testing

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Acoustic Emission is a well known technique for online damage detection in metallic and composite structures for several decades. In order to overcome the drawback of large data amounts arise during permanent on line AE monitoring AIT developed an Acoustic Emission on Demand Algorithm. This algorithm requires only AE data from a few load cycles to quantify and locate e.g. impact damages in composite structures. So far this algorithm was proven to work under laboratory conditions on small scale specimen.

In this paper the authors present the recent results achieved on impact damaged large aircraft panels subjected to different mechanical and environmental loads. The investigated part was a rear wall panel used in a small aircraft type VUT 100 Cobra made of 2 mm monolithic GFRP. All panels have been equipped with 4 conventional AE and 4 nonconventional piezo sensors to acquire the AE events. Data acquisition has been performed with a transportable 4 channel PAC jIDISP AE system. Cycling bending tests up to 30% of the static failure strength have been conducted in an environmental chamber using temperatures up to 85°C and a relative humidity up to 90%. After the laboratory tests the rear wall panels have been mounted in a VUT 100 Cobra aircraft and flight tests with online AE monitoring in different flight regimes have been performed.

During the environmental laboratory and flight tests impact damages of 20 J and larger could be detected and located with an accuracy of better than 5% relative to the average sensor spacing when using sufficient loading.

Ключевые слова:

Содержание.

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