LAMB WAVE ANALYSIS AND DAMAGE DETECTION IN A SKIN-STRINGER COMPOSITE JOINT

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Key words: Lamb waves, Skin-stringer joint, Thermoplastic composites, Impact damage detection, Probabilistic algorithm.

Abstract. *Lamb wave qualitative analysis and impact damage detection in a bolted skin-stringer thermoplastic composite component were performed. The structure belongs to an aircraft structural part and represents a complicated structure from the Lamb wave mode identification perspective, especially when the joint is realized only by Hi-Lok fasteners. The sensor network for damage detection included 16 PZT disc transducers, however, additional sensors were exploited for supporting measurements. Two frequencies, representing A0 and S0 modes, were used to evaluate the propagation across the joint. Several impact damages were introduced to the stringer and skin parts of the structure. Suitable propagation mode and frequency for damage detection within the specific skin-stringer part were identified. Sensor configuration divided the test specimen into several sections and enabled measurements within a specific section with a specific frequency. The time delay of A0 mode at 50 kHz was exploited for impact damage detection within the skin part, and S0 mode at 180 kHz within the stringer part. The probabilistic algorithm was successfully used for the damage imaging. The damage index was based on the time delay of the selected mode, comparing baseline measurement and measurement in the damaged state. This study provides a possible methodology for structural health monitoring of aircraft structural parts made from bolted thermoplastic composite skin-stringer joints.*