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PROPAGATION OF THE ULTRASONIC GUIDED WAVE IN A COMPOSITE PLATE: SOME RESULTS OF SIMULATION AND TEST

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The guided wave technology (GWT) is one of the most effective means of structural damage detection in the thin-walled structural elements. Its application for structural health monitoring (SHM) of aircraft is very perspective. This technology is applicable as for Al alloy, as composite structure and has many important advantages in comparison with others methods. The main of them is the ability to detect very large surface of structure at distance about some meters and more. Therefore, the properties of GWT are intensively investigated in view of practical use in the systems of SHM. In presented paper as a first step the computational simulation was performed for classical 2-D model of composite layer with some local damage. It shows fundamental properties of guided wave guided wave interaction with damage. The result of interaction with damage in thin-walled composite plate is shown in Fig. 1. Initial impulse is generated by a piezoceramics transducer that is glued on a surface of the plate in its center ($x = 0.25$ m). In point $x = 0.1$ m there is a small damage. It is possible compare S0 mode of impulse transformation and its partial conversion to A0 mode (left part of signal) with symmetrical signal in undamaged part of a plate (right part of signal). Both this effect can be effectively used in the system of SHM of thin-walled composite components of aircraft.

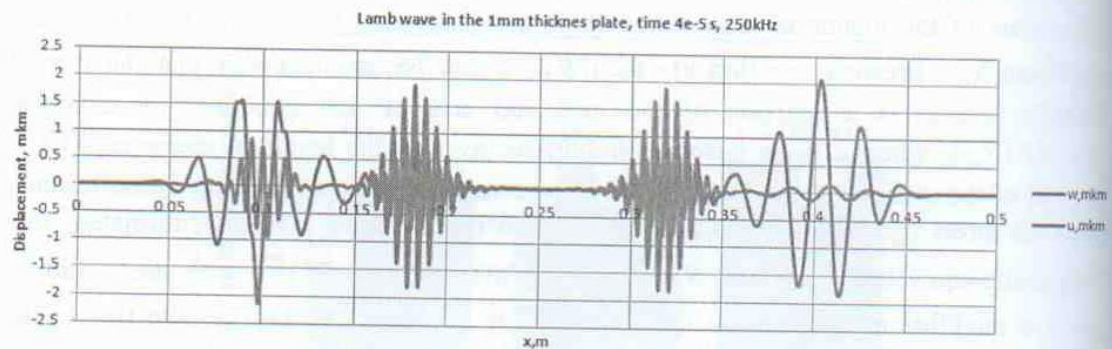


Fig. 3. The guided wave interaction with damage of 1mm composite plate (length 0.5 m).

Some regularities of ultrasonic guided wave propagation in composite sheet with different kinds of damage were investigated by the simulation and also in special test. The problems of the use of GWT in SHM of aircraft for damage detection in composite components are discussed.

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