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Assessment of uncertainty in damage evaluation by ultrasonic testing of composite structures

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Abstract

Ultrasonic testing (UT) is a commonly used non-destructive testing method of composite materials. UT enables determining a geometry of internal damage, its surface area and depth location. However, measurement uncertainty should be taken into consideration when interpreting UT results, which follows from various factors including the test material parameters and selection of the operating parameters, such as the scanning method and applied transducer's characteristics. Moreover, uncertainty in the flaw size assessment is caused by signal or image processing methods applied to the obtained ultrasonic scans, which may return incorrect results. The article presents an overview of factors influencing the measurement uncertainty depending on variable UT parameters, with reference to appropriate standards, as well as post-processing of the obtained scans. The experimental studies aimed at investigation on the measurement errors were performed on composite specimens made of CFRP with flat-bottom holes of various diameters using the Pulse-Echo and the Phased Array UT methods.

Keywords: ultrasonic testing, composite structures, damage evaluation, measurement uncertainty, image analysis

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