ABSTRACTS

Carbon composites due to their specific properties find applications in various industries, especially in aerospace industry. Widely used carbon fibre reinforced polymers (CFRP) have already been applied even for the aircraft primary structures. The development of advanced diagnostic techniques that are able to easily detect and identify the degradation of the carbon fibre material is still a challenge for various NDT methods. This paper describes the possibility to apply eddy current (EC) for testing of carbon composite structures. Two types of eddy current probes were developed and tested with excellent results. The new conventional eddy current probes are able to reliably and easily detect surface and subsurface discontinuities such as delamination and thickness variation. The probe setting parameters are described for different types of carbon composites (type of matrix and reinforcement, layup). Precise settings are necessary for the successful eddy current testing. It was determined that reliable detection of a minimum surface defect size is Ø1.5 mm for specimens and that eddy currents are able to penetrate into a thickness up to approximately 4 mm depending on the type of carbon composite. Additionally, this paper describes the comparison of eddy current testing with ultrasonic phased array method (PAUT). Composite aircraft structures are very susceptible to impact damage usually detected using PAUT. Therefore, sensitivity and resolution analysis of impact damage detection was performed by means of these two methods. It was found out that the results are very similar to each other when standard pulse-echo technique of PAUT was used. This carbon composite eddy current testing (CCECT) could fully replace or complement other NDT methods such as visual or ultrasonic inspections. CCECT could guarantee the product quality in production using the robotic system with appropriate visualisation especially for large area testing, also in aircraft maintenance and in the development of new aircraft structures.

KEYWORDS
Eddy current, Carbon, Composite, Inspection, Aircraft