ABSTRACT

This work presents the development of intelligent systems applied to the monitoring of aircraft structures addressing two distinct models: the first is the analysis and classification of ultrasound images of aircraft structures in order to support decisions on repair of aircraft structures. A scope of work was defined as a cross section of the wing of the aircraft model Boeing 707. After the removal of surface material in damaged areas by corrosion, thickness measurements in the whole structure are evaluated. Based on the measurements, the Engineering performs structural analysis, observing the limits determined by the maintenance manual and determining the necessity of repair. The second model includes the method of electromechanical impedance. It is proposed to develop a low cost monitoring system applied to an aircraft aluminum bar with 10 positions for fixing nuts and bolts. The goal of the system is to classify an impedance curve in the condition of the aluminum bar if there is or not a damage to the structure and, in case of the existence of damage, indicating their position in the aluminum bar and if the damage is severe or not. The following classifiers were used in this work: support vector machines, artificial neural networks and K nearest neighbors.

Keywords: Classifiers; Structural repair; Ultrasound, Aircraft maintenance; Monitoring structures; Electromechanical impedance; Intelligent systems; Multi rate processing.