Electromechanical impedance monitoring is investigated to quantify changes in physical and mechanical properties during the ageing of composite plates. In this context, an experimental measurement protocol is proposed, on the basis of a broadband 1 MHz center frequency piezoelectric transducer. After a preliminary characterization of the parameters of the transducer itself, the acoustical impedance of the front medium is deduced. More particularly, the acoustical properties such as longitudinal wave velocity and attenuation are identified in the studied composite carbon/epoxy plates. From the electrical measurement results in the MHz frequency range, the acoustical impedance of the plate is plotted in the complex plane, showing characteristic signatures corresponding to the actually monitored composite plate. The ageing is quantified, showing the effectiveness of this non-destructive evaluation method. First, the acoustical parameters of an carbon/epoxy composite plate are modeled in order to study their sensitivity. During the ageing, those acoustical properties are known to evolve significantly, i.e. a decrease of the wave velocity and an increase of the attenuation, which can both be related to the increase of the porosity level in the plate. Secondly, these acoustical properties are evaluated on a set of samples which were submitted to a range of ageing duration from 500 to 5000 h performed at a thermostated temperature of 180°C. The feasibility of the evaluation of the ageing is demonstrated, and the precision of this measurement is discussed both in terms of temperature dependency and reproducibility.