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Measurement of nonlinear vibration response in aerospace composite blades using pulsed airflow excitation

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ABSTRACT

With increased use of composite materials and more complex designs, nonlinear behaviour of aero engine components has become a more common occurrence. However, both numerical and experimental tools currently available are mostly limited to linear dynamics range. The development of new or improved tools is therefore needed in order to deal more reliably with the identification and quantification of nonlinearities.

In this work, an experimental method for the structural testing of composite components in presence of nonlinear vibrations is presented. The method is based on the use of a chopped air-jet vibration exciter providing non-contact input force at the frequency of the pulsating airflow. The non-contact nature of this type of exciter prevents the impedance mismatch issue existing when more traditional systems such as electromagnetic shakers are used. This way, the excitation force is transmitted more efficiently over the whole dynamic response range.

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