Vibration analysis of an aviation engine turbine shaft shield

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Abstract

This article deals with the vibration problem of the arbitrary chosen aircraft engine turbine shaft shield [1]. Physical model of the system under study is inspired by the PZL-10W aviation jet engine shaft shield (see Fig. 1). Discussed object is a structure of the profile circular arc (see Fig. 1b). The main goal of the presented research is to develop the modal model of the discussed object. To realize this task FEM (finite element method) simulation and experimental investigation were conducted.

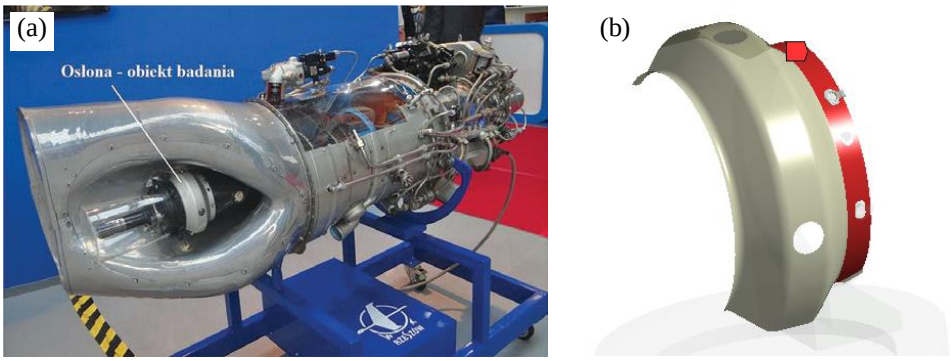

Fig. 1. (a) jet engine PZL-10W with the element under investigation marked [2], (b) element under study [3].

Firstly, according to technical documentation [3], geometrical model of the considered system in SpaceClaim modeler was prepared.

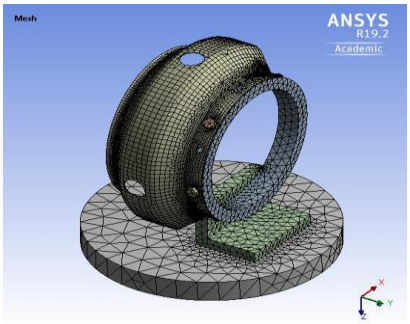

Fig. 2. FE model of the considered object.

Then the FE (finite element) model of the discussed object was generated by using ANSYS/Workbench software. The elaborated FE model includes the object fixation, expected in the planned experimental test (see Fig. 2). Subsequently modal experiment is carried out on a real object (see Fig. 3). The bench tests are conducted in order to verify the developed FE models of the discussed object and to investigate the impact of the damage to the shield on the change of dynamic properties of the tested object (the values of the natural frequencies and changing the shape of the corresponding natural forms).

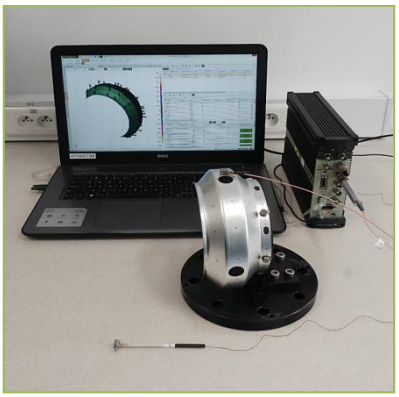

Fig. 3. The measurement experiment.

The convergence of the results obtained is determined on the basis of adopted mismatch measures. The relative error of natural frequencies and the similarity of the vibrations are determined on the basis of the MAC indicator.

References:

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