AAP CNES 2025

Phd Proposition

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Area: Transport spatial

Subject:

Spectral study associated with rotor/stator contacts in space turbopumps

The ArianeGroup SAS turbomachinery department aims to improve its understanding in the field of rotordynamic and certain complex non-linear phenomena observed on turbopumps. In particular, a phenomenon, linked to the appearance of spectral lines associated with Rotor/Stator contacts, is part of the singular signatures still not understood in the vibration behavior of turbomachines and can be synonymous with the loss of structural integrity. Also, it is crucial, through both numerical and experimental approaches, to deepen knowledge to understand the appearance of spectral lines and assess their impact on the dynamic behavior of space turbopumps.

The challenge of the PhD lies in particular in the use of the rotor bench of INSA Lyon, to highlight and characterize the phenomenon of the appearance of spectral lines through a dedicated test campaign. This bench is versatile enough to adopt an architecture close to that of a turbopump. In addition, INSA Lyon has a 6-axis hydraulic exciter to assess the influence of base movements on rotor dynamics and determine the cause of the targeted spectral lines. At the same time, an internal rotordynamics code will be used upstream to provide assistance in adapting the bench and in the calculation/measurement comparison step.

Once the numerical model has been updated using this "proof of concept" bench, it will be used to simulate the dynamic behavior of a turbopump in operation.