DISSEMINATION REPORT

Report Title: **The Effect of Unsteady Aerodynamic Asymmetric Perturbations on the Mode Shape Sensitivity of an Oscillating LPT Cascade**

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Abstract:

The effect of unsteady aerodynamic asymmetries on the mode shape sensitivity of an oscillating low-pressure turbine (LPT) cascade is investigated. The asymmetries arise from aerodynamic mistuning and are treated here on a random basis as perturbations of blade influence coefficients. The nominal aeroelastic properties are determined experimentally for three orthogonal modes (two bending mode, one torsion mode) and different reduced frequencies such as to span aeroelastic stability maps. Influence coefficient test data are acquired in a controlled-oscillation test facility. The novelty of the present study lies in addressing the dependence of mode shape stability on perturbation levels that are applied to the aerodynamic influence coefficients. The effects are discussed based on a probabilistic background.

The study shows that for the present set of perturbation data the effect of aerodynamic asymmetries does not affect the aeroelastic stability uniformly over a range of modes. Instead mode regions have been identified that show a greater dependence from aerodynamic asymmetries, both in terms of minimum stability as well as destabilization probability. Modes affecting the passage throat efficiently seem to be less subject to the effect of asymmetric perturbations. On the other hand, torsion-bending types of modes with a torsion centre away from the blade pressure side show the greatest effect of stability change.

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