

# Probabilistic design strategy for transiently stressed turbine components

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Probabilistic methods are used in turbomachinery engineering to account for uncertainties in modeling. This work focuses on developing a probabilistic process for high-fidelity disk life investigation that can reflect on the combined influence of manufacturing, thermal, and material variability. Life assessment is performed by means of finite element analysis and the Rolls-Royce tool "Perseus", which are embedded in a Monte Carlo framework. Thereby, we aim at an improvement on the current method with a modular process that operates independently of its components.

Another focus of our work is robust optimization with surrogate models. We employ Gaussian process (GP) regression on the example of mechanical behavior of blade-disk-contact and benchmark it against least-squares regression. A probabilistic tool called MetamodelGUI, which is being developed at the Chair of Turbomachinery and Flight Propulsion at Technische Universität Dresden, is utilized to evaluate the probabilistic analysis, and to identify features critical to disk stress.