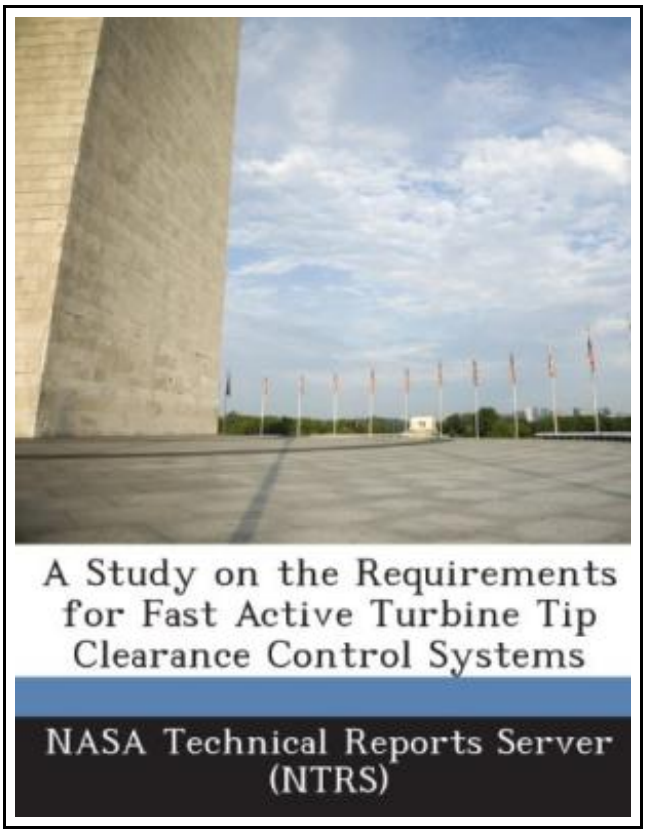
A Study on the Requirements for Fast Active Turbine Tip Clearance Control Systems



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A STUDY ON THE REQUIREMENTS FOR FAST ACTIVE TURBINE TIP CLEARANCE CONTROL SYSTEMS

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BiblioGov. Paperback. Book Condition: New. This item is printed on demand. Paperback. 28 pages. Dimensions: 9.7in. x 7.4in. x 0.1in.This paper addresses the requirements of a control system for active turbine tip clearance control in a generic commercial turbofan engine through design and analysis. The control objective is to articulate the shroud in the high pressure turbine section in order to maintain a certain clearance set point given several possible engine transient events. The system must also exhibit reasonable robustness to modeling uncertainties and reasonable noise rejection properties. Two actuators were chosen to fulfill such a requirement, both of which possess different levels of technological readiness: electrohydraulic servovalves and piezoelectric stacks. Identification of design constraints, desired actuator parameters, and actuator limitations are addressed in depth; all of which are intimately tied with the hardware and controller design process. Analytical demonstrations of the performance and robustness characteristics of the two axisymmetric LQG clearance control systems are presented. Takeoff simulation results show that both actuators are capable of maintaining the clearance within acceptable bounds and demonstrate robustness to parameter uncertainty. The present model-based control strategy was employed to demonstrate the tradeoff between performance, control effort, and robustness and to implement optimal state estimation in a noisy engine environment with intent to eliminate ad hoc methods for designing reliable control systems. This item ships from La Vergne,TN. Paperback.

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