

Case History: Multi-rotor Gas Turbine Rotordynamic Analysis Incorporating Casing Supports

An area of concern for gas turbine OEM's and end users is the effect of casing and structural supports on the rotordynamic response of multi-rotor systems. MSI has conducted sophisticated analysis of such problems utilizing the latest technology available in Finite Element Analysis (FEA) and rotordynamics. Figure 1 shows an aircraft gas turbine FEA model developed utilizing ANSYS. By conducting a forced response analysis of a proposed weight reduction of the casing, the frequency dependent response of the structural forces and vibrations at the bearing support locations was determined. Figure 2 shows the transfer function representation of this frequency dependent response.

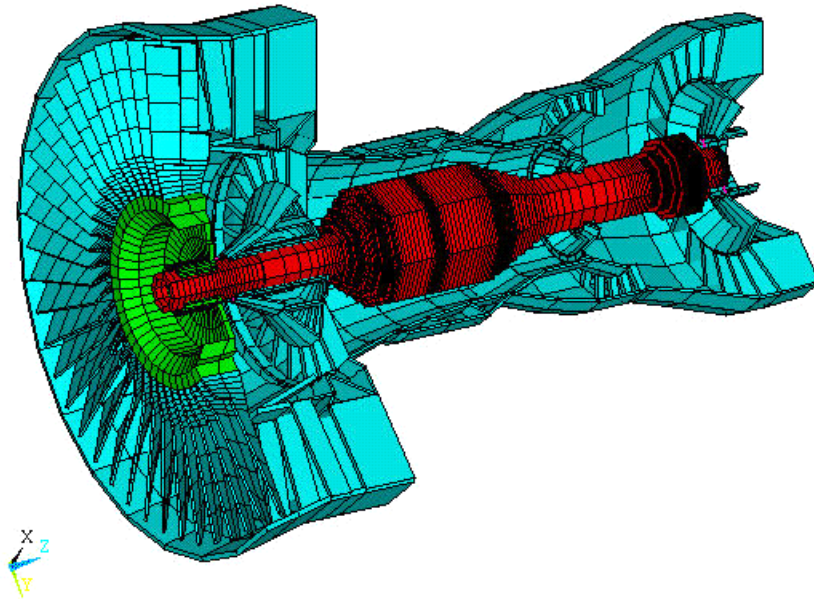


Figure 1: FEA Model of Gas Turbine Casing and Dual Rotors

The transfer function was then incorporated into a multi-rotor rotordynamics model for analysis. Figure 3 shows the rotor model created utilizing the University of Virginia ROMAC suite

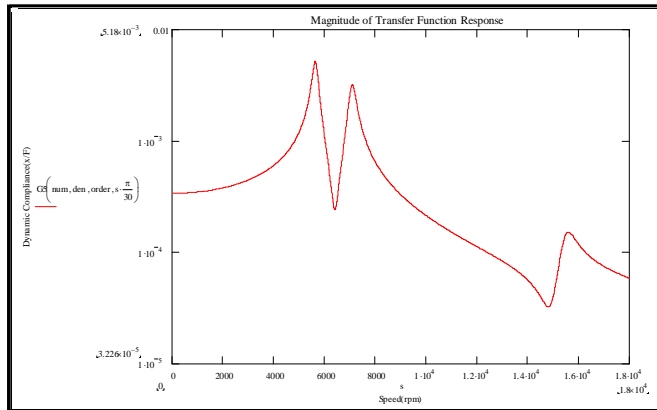


Figure 2: Transfer Function Representation of Hypothetically Reduced Weight Casing Support Stiffness

of rotordynamics codes. This model incorporated the structural supports as determined with ANSYS with the full multi-rotor system. The resulting multi-level model was able to analyze the engine for forced response, lateral stability and both damped and undamped mode shapes.

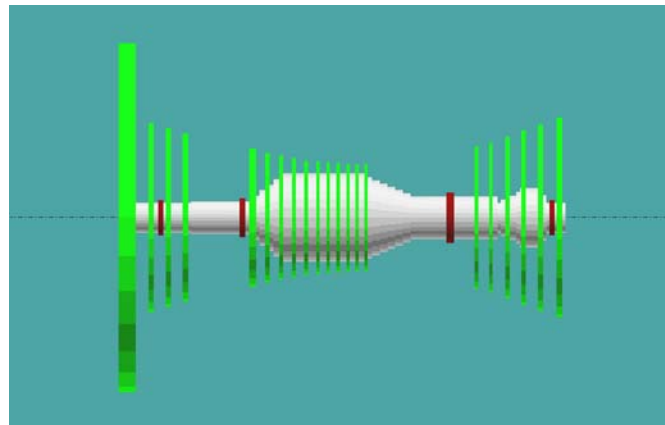


Figure 3: Rotordynamic model of multi-rotor system with transfer function representation of the casing support incorporated into the bearing support stiffness

Based on this more complete model, issues associated with structural supports and their affect on lateral rotordynamics can be properly assessed.

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