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Simulation on Fuel Metering Unit Used for TurboShaft Engine Model

Authors : Bin Wang, Hengyu Ji, Zhifeng Ye

Abstract : Fuel Metering Unit (FMU) in fuel system of an aeroengine sometimes has direct influence on the engine performance, which is neglected for the sake of easy access to mathematical model of the engine in most cases. In order to verify the influence of FMU on an engine model, this paper presents a co-simulation of a stepping motor driven FMU (digital FMU) in a turboshaft aeroengine, using AMESim and MATLAB to obtain the steady and dynamic characteristics of the FMU. For this method, mechanical and hydraulic section of the unit is modeled through AMESim, while the stepping motor is mathematically modeled through MATLAB/Simulink. Combining these two sub-models yields an AMESim/MATLAB co-model of the FMU. A simplified component level model for the turboshaft engine is established and connected with the FMU model. Simulation results on the full model show that the engine model considering FMU characteristics describes the engine more precisely especially in its transition state. An FMU dynamics will cut down the rotation speed of the high pressure shaft and the inlet pressure of the combustor during the step response. The work in this paper reveals the impact of FMU on engine operation characteristics and provides a reference to an engine model for ground tests.

Keywords : fuel metering unit, stepping motor, AMESim/Matlab, full digital simulation
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