

Aircraft Single-Spool Single-Jet Engine with Variable Area Exhaust Nozzle

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Abstract—This paper deals with an aircraft single-spool single-jet engine equipped with variable area exhaust nozzle. Nozzle's exhaust area controller was studied in some previous papers; one has chosen the controller based on turbine's pressure ratio, completed with flight regime corrector. The studied aircraft engine is VK-1F type; its mathematical model, its transfer functions for main and secondary parameters, as well as their co-efficient for a constant operating regime were here deduced. The embedded system (engine + exhaust nozzle) was identified as a single input system (which is the throttle's angular displacement θ) with an inner feedback after the engine's speed n ; main system outputs are the speed n and the combustor temperature T_3^* . One has built the block diagram with transfer functions, which was the basic system for further Matlab simulations. System's quality has been studied in two cases: considering only the engine with exhaust nozzle (JEVEN), having as single input the fuel flow rate Q_c , respectively considering the embedded system, where the fuel flow rate is controlled by an appropriate controller (FIC). Simulation results were compared with other similar cases in the literature. Paper's content, conclusions and observations can be used for further studies, such as studies concerning aircraft double- or multiple-spool jet engines with variable area exhaust nozzles, without or with afterburning.