

Blade Design and Thrust Performance for a Miniature Turbojet Engine

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Abstract

The development of an axial-flow turbine and centrifugal compressor for P60 engine which is a small, low cost, 50-lbf-thrust turbojet engine, with a single-shaft turbojet with a bell-mouth inlet, a single-stage mixed-flow compressor, a through-flow annular-type combustor, a single-stage axial-flow turbine, and a converging-only exhaust duct. The detailed design process and main considerations from conceptual, preliminary, to final design stages are complex and tedious. The major difficulties are in doing design trade-off based upon many constraints, such as engine geometric dimensions, aerodynamic performances, stress analysis, mechanical design and manufacturing considerations. At first, with the aids of engine cycle analysis, the parameters for each sub-system may be predicted. Thereafter, based on these parameters, the conceptual design and parametric study can be performed. The acceptable result is obtained after combining the try-and-error method with many compromises under constraints. Finally, the compressor and turbine blades are generated to match the requirement of P60 engine system. The rotor system is established. An important discussion for the P-60 engine system brief descriptions and thrust performance test will be included. The pressure ratio versus rotational speed for compressor, and thrust versus rotational speed for two engines; both results show design well match with the requirements. The

modified P-60 has double times of thrust than the original reference KAVAN engine.

Keyword : Compressor, Turbine, Combustor, Blade Design, Trust, Small Turbojet Engine