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Investigation of Turbocharger Conversion to Turbojet Engine

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Turbocharger jet engine combines knowledge of fluid mechanics, thermodynamics, heat transfer and jet propulsion. This paper describes how a turbojet engine is built using an industrial turbocharger. A unique design of combustion chamber is developed, which has a helical shape to reduce form drag. A test rig is manufactured, whereas measuring instruments are used for recording and analyzing the output data. The test rig allows a complete measuring of thermodynamic parameters along different engine sections which is suitable for educational purposes. A data acquisition allows a real-time engine analysis. Different types of auxiliary systems as starting system, ignition system, LPG fuel injection system, oil and oil cooling system are fabricated to run a self-sustaining engine.

TJE cycle analysis is elaborated to calculate the engine specific thrust and specific fuel consumption for given engine cycle parameters: compressor pressure ratio and turbine inlet temperature. Reverse aero thermodynamic design and analysis of compressor-turbine are done to assist the engine combustion chamber and exhaust nozzle design. Along the project elaboration both hand calculations and software packages are used for engine performance prediction. Finally, this project is completed using a limited financial support compared to the obtained test rig capabilities.