Design of an Opposed-piston, Opposed-stroke Diesel Engine for Use in Utility Aircraft

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Abstract
The objective of this thesis was to determine the feasibility of using an opposed-piston, opposed-stroke, diesel engine in utility aircraft. Utility aircraft are aircraft that have a maximal takeoff weight of 12,500lbs. These aircraft are often used for transportation of cargo and other goods. In order to handle that weight, many of the aircraft are powered by turboprop engines. Turboprop engines are a style of jet engine with power capabilities ranging from 500 to several thousand horsepower (hp). They are expensive engines, and in the case of the Piper Mirage, substituting the piston engine with a turboprop engine can increase the cost of the aircraft by $1 million. In order to reduce the price tag, a piston-powered, propeller engine is desired. Currently, however, most modern piston driven aircraft engines max out around 400hp. The Piper Mirage referenced has a power output of 350hp. Because of this, it was necessary to see if an opposed-piston, opposed-stroke, diesel engine would be able to increase the power output in order to compete with the turboprop engine. The Foundation for Applied Aviation Technology determined that the minimum power output of an opposed-piston, opposed-stroke diesel engine should be 800hp at takeoff at an engine speed of 3600 revolutions per minute (rpm). Opposed-piston, opposed-stroke diesel engines have been used previously in aircraft and perhaps most famously in the Junkers Jumo 205 and 207 engines built in the 1940s. Both of these were opposed-piston, opposed-stroke, diesel engines that generated between 700 and 1000hp at takeoff. However, the Junkers engines were large engines used in large multi-engine aircraft. This thesis determines that the required size for an engine of this output can be reduced by 25% compared to the Junkers engine with a potential weight savings of up to 500lb, a better specific fuel consumption, and a greater power output of over 1200hp.

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His design was for an opposed-piston, two-stroke, diesel engine. Beyond the use of opposed pistons, the Michel engine was unique in that it was a crankless cam engine. With minor changes in the basic engine design, the cylinder group could either be stationary or rotate like a rotary engine. Michel filed a patent application for his engine configuration in Germany on 20 July 1920 and in the United States on 23 August 1921. Drawings from Hermann Michel’s original patent show two- and three-cylinder cam engines. In the drawings, the cylinder group was stationary and the cam ring rotated. The upp