

THE DESIGN AND FABRICATION OF A RAMJET  
ENGINE FOR THRUST MEASUREMENT IN  
THERMODYNAMIC LABORATORY

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S U M M A R Y

The initial intentions of the authors was to design and fabricate a rocket engine for thrust measurement in Thermodynamic laboratory. But this was not accomplish due to the difficulties in obtaining Suitable propellant for use as its fuel. The use of solid propellant (Cartridge type) was suggested for this purpose having the advantage of compactness and ease of handling. However the authors found out later that cartridges manufactured under such items comes within the same explosive category as Shotgun ammunition which involves high security and explosive risk.

Instead the authors investigate the thrust produced from a ramjet engine which involves the design, fabrication and testing of the unit. The ram-jet engine which has virtually no moving internal mechanisms (ie no fan, turbine or compressor) is the simplest concept of an aircraft propulsion unit, consists of only a diffuser a combustion chamber and a nozzle, open at both ends. It relies on its forward speed to ram air into the front opening. Fuel is burnt inside the duct so as to accelerate the air stream which together with the product of combustion, issues from the rear as high velocity jet. A change in momentum will then produced the propulsive force or thrust.

(II)

A C K N O W L E D G E M E N T

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## 1. INTRODUCTION

Propulsion is an engineering field of study which pertains to the research, development, and design of systems capable of generating a thrust to push or propel a vehicle forward. The vehicle may be an aircraft, a spacecraft or even a marinecraft. Jet propulsion is a specialized field dealing with propulsion system in which the generation of thrust is achieved by direct expansion of the gas used by the engine in a jet nozzle. In most cases, the jet engine (sometimes also called the propulsor) is designed to propel the vehicle in flight, as in the case of an aircraft or a spacecraft.

Generally speaking, all methods devised to produce a thrust force for propulsive purposes are based on the principle of the time rate of change of momentum of a fluid accelerated by the system under consideration. The fluid may be the gas used by the engine itself, as in a turbojet, or it may be the fluid available in the surrounding environment such as the air used by the propeller, or it may be stored into the vehicle and carried by it during the course of its flight as in case of a rocket engine.

Propulsive engines can be divided into two major divisions, namely the air breathing and non air breathing engines. Figure 1.1 presents the various types of propulsion engines in diagrammatic form, showing the inter-relationships where they exist.