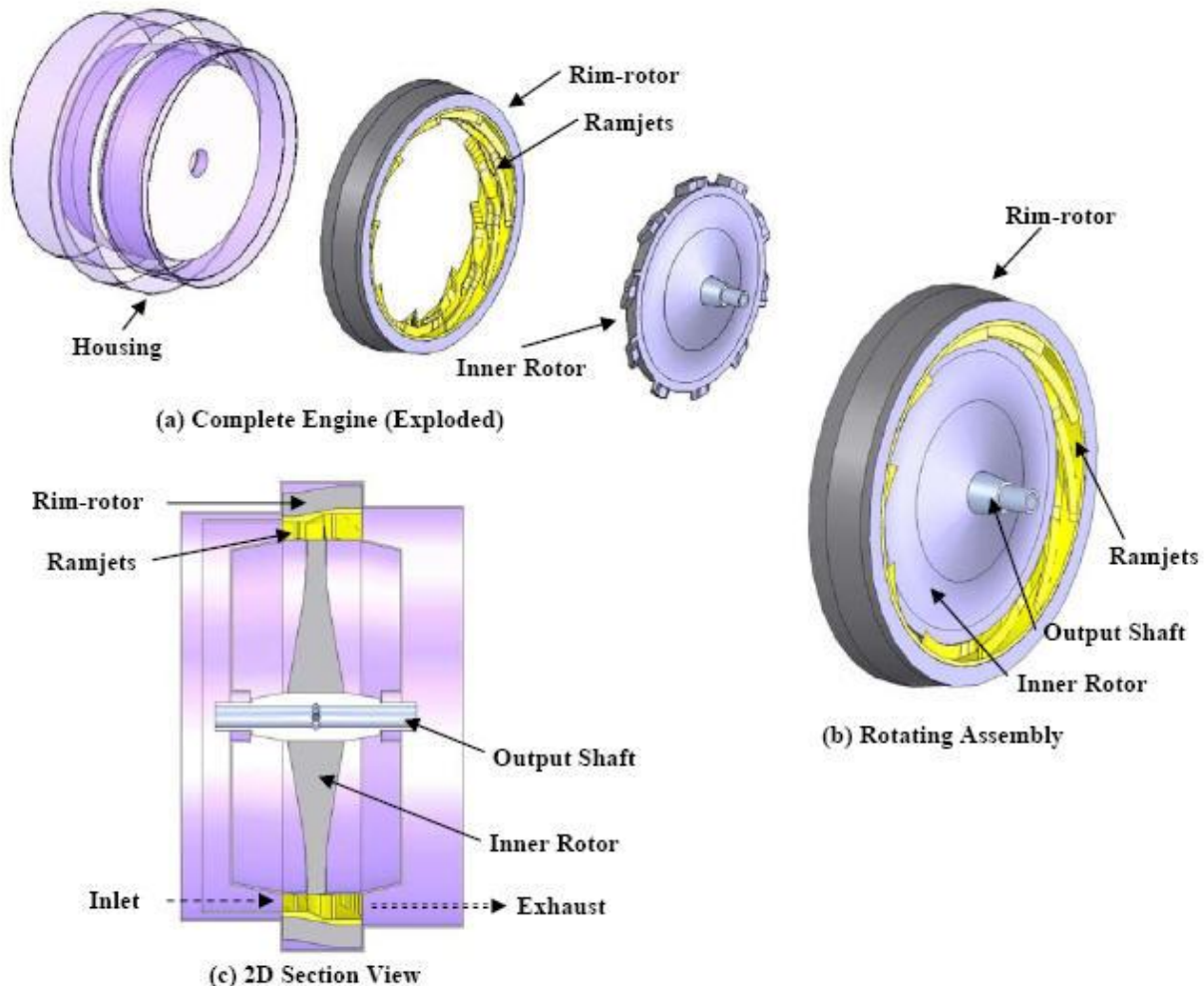# Rim-rotor Rotary Ramjet Engine

CAMUS Team:

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- David Rancourt (MS Student)
- Mathieu Picard (Future MS Student)

Collaborators:

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Project:

The research studies a new engine concept based on rotating ramjets. Ramjets are thrust producing supersonic engines with no moving part. In the proposed engine, ramjets are brought to supersonic speeds while being attached to a high speed rim-rotor flywheel. At tip speeds of Mach 3, the ramjets produce significant thrust and therefore deliver large amounts of rotating power:

(a) Complete Engine (Exploded)

(b) Rotating Assembly

(c) 2D Section View

Rim-rotor Rotary Ramjet Engine

This engine technology has high power-to-weight ratios (10kW/kg vs 1.6kW/kg for high power piston engines) and could be manufactured at relatively low production costs (similar to today's automotive turbochargers). Efficiencies are similar to piston engines (10-30%).

Rotary ramjet engines could be used in applications requiring large amounts of power and low system mass. One key application is for developing hybrid fuel cell power trains that could significantly reduce the cost of fuel cells powered vehicles. For exemple, a hybrid fuel cell system using the proposed engine would have costs of ~22$/kW compared to the actual costs of full fuel cell systems of ~73$/kW. Moreover, system weight and size would be about 3 times lower (from 163kg to 50kg and 114L to 31L), further improving fuel economy and easing vehicle design. The engine has multi-fuel capabilities and can operate on any kind of gaseous or liquid fuels.

The research aims to demonstrate the feasibility of the proposed technology by showing that a ramjet designed for the rim-rotor configuration can produce thrust and by showing that a representative rim-rotor engine can achieve rim speeds of Mach 3.
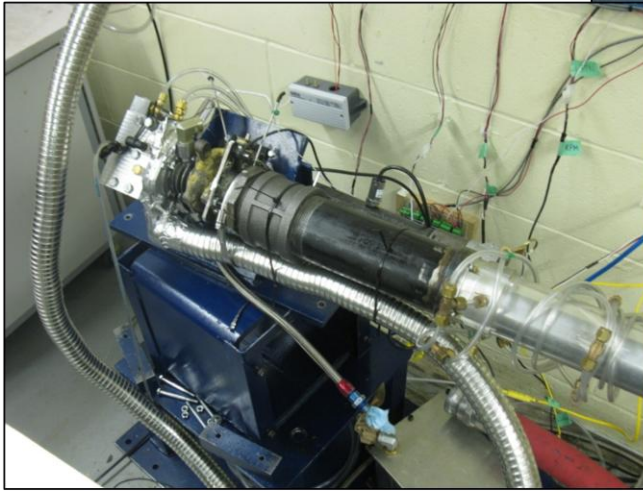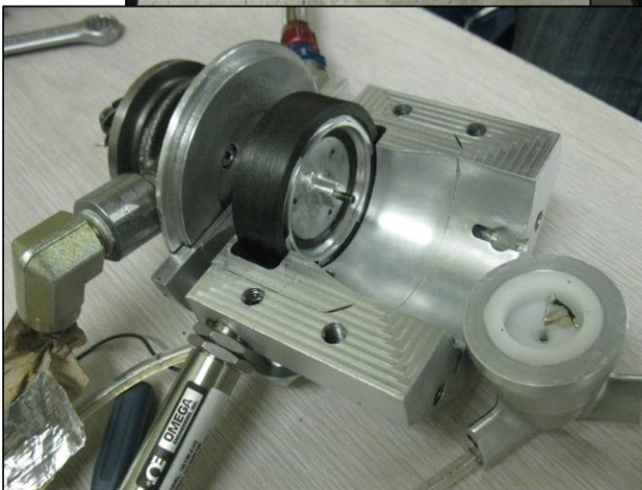
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RAMJET PRINCIPAL (Wikipedia):
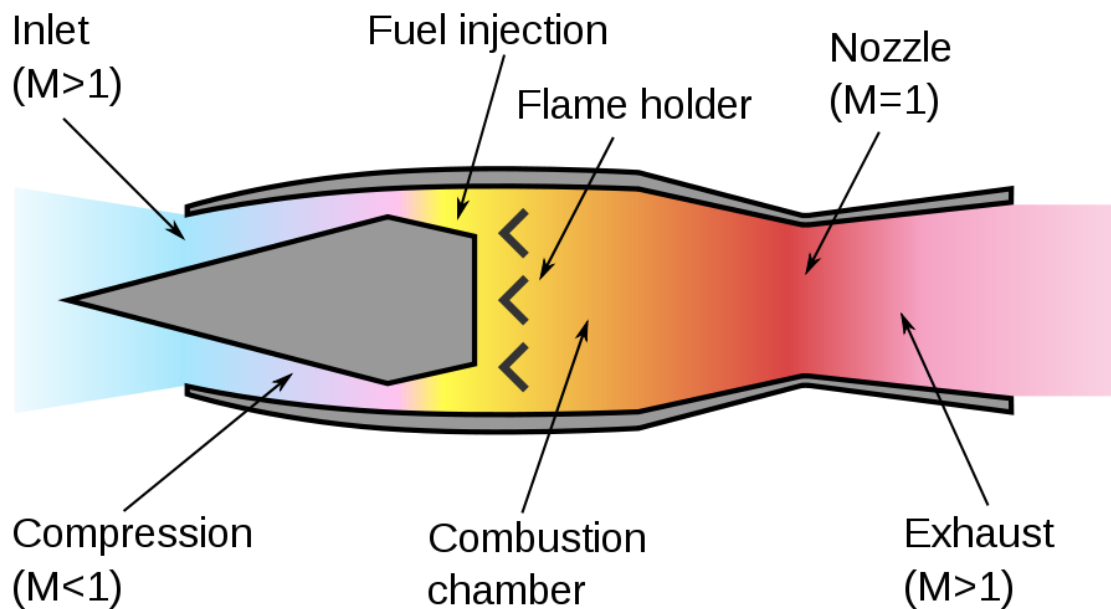
Rim-rotor Rotary Ramjet Engine

Prototype test bench

Design, validation, realization >> 1st R4E test!!