
delta
motorsport

COMPANY BACKGROUND

Core business is a world-class motorsport, automotive and high performance engineering consultancy

Pedigree in design, build and development of components, systems and complete vehicles from a clean sheet of paper

Broad range of skills built around a core of innovative and imaginative design expertise:

- Styling design (sketch programs, clay modelling, Alias surfacing)
- Engineering design (Catia V5)
- Simulation (FEA, CFD, multi-body, drive cycle)
- Concept or low volume vehicle build
- Sub-system and vehicle test & development

COMPANY BACKGROUND
MOTORSPORT

Grand Prix Masters: design, build, operations

2-seater F1-style car: design, build, operations

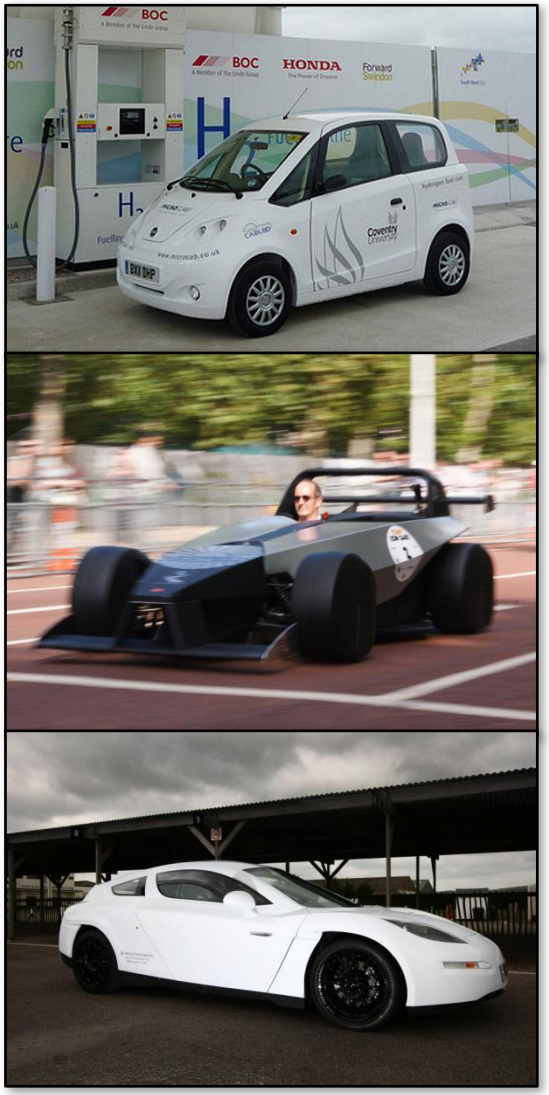
Formula 3: Wind tunnel program

Le Mans Sportscar safety: Aerodynamic study for FIA

Superleague Formula: Race engineering & team operations

Formula 1: Component & sub-system design

Le Mans Prototype: 2012 & 2013 World Endurance Championship and Le Mans (Official Nissan Partner Team in LMP2 for 2013)



COMPANY BACKGROUND

LOW CARBON (ELECTRIC & HYBRID)

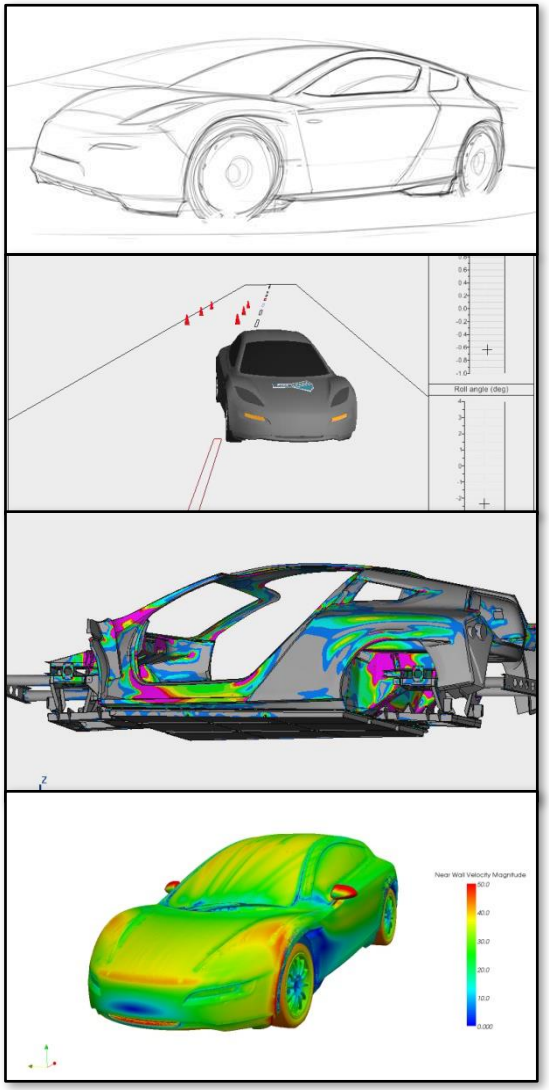
Microcab hydrogen hybrid

Westfield Sport-E

Westfield iRacer

High power (300kW) liquid-cooled battery pack design

Delta E-4 Coupe



THE DELTA E-4 COUPE

BACKGROUND

Initial concepts late 2006

Engineering design and simulation commenced early 2009

- Identify key factors for energy efficiency
- Opportunities for Delta to innovate

5 cars built and on the road March 2011

Significant inward investment with grant support from

- East Midlands Development Agency (regional)
- Technology Strategy Board (national)
- Niche Vehicle Network (sectoral)

THE DELTA E-4 COUPE

OVERVIEW

Ultra-compact battery-electric 2+2 Coupe

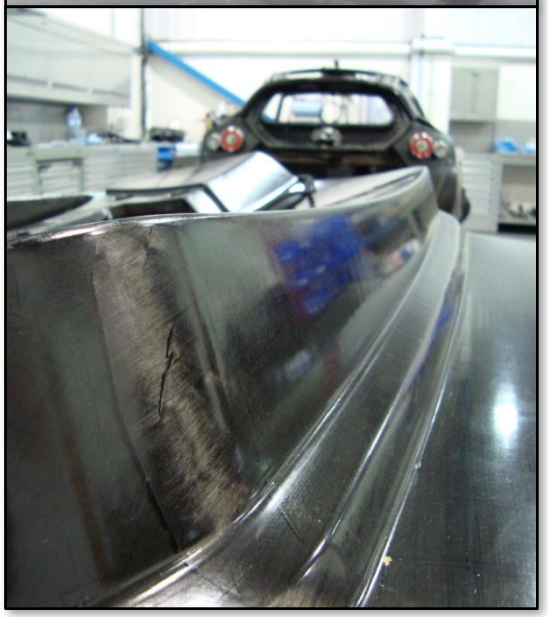
Two- or four-wheel drive

0-60mph in 6.5s (4.5s for 4WD)

140 miles range (200miles+ with larger battery pack)

Top speed well over 100mph

975kg (1250kg for 4WD with larger battery pack)



THE DELTA E-4 COUPE

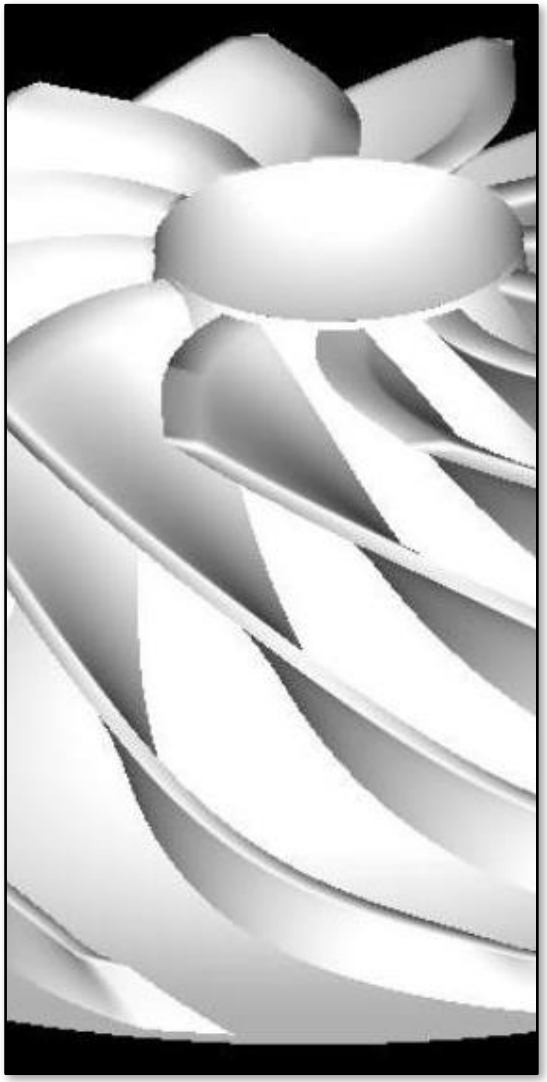
UNDER THE SKIN

Low Cost Composite Structures

Chassis 60% lighter than conventional steel equivalent

Developments in design, materials & processing to reduce material cost, labour content and optimise structure

Research & development programs now under way with a number of vehicle manufacturers



Low Cost Compact Range Extender

Research began early in 2010, with analysis of all options for energy converter (range extender)

TSB-supported feasibility study 2011-12 to confirm power output and investigate cost

Collaborative R&D program to develop a 15kW (electrical output) microturbine device commenced in November 2012, again supported by TSB (now Innovate UK)

- Bench demonstrator Autumn 2015
- Vehicle demonstrator Spring 2016

MiTRE: Initial Applications

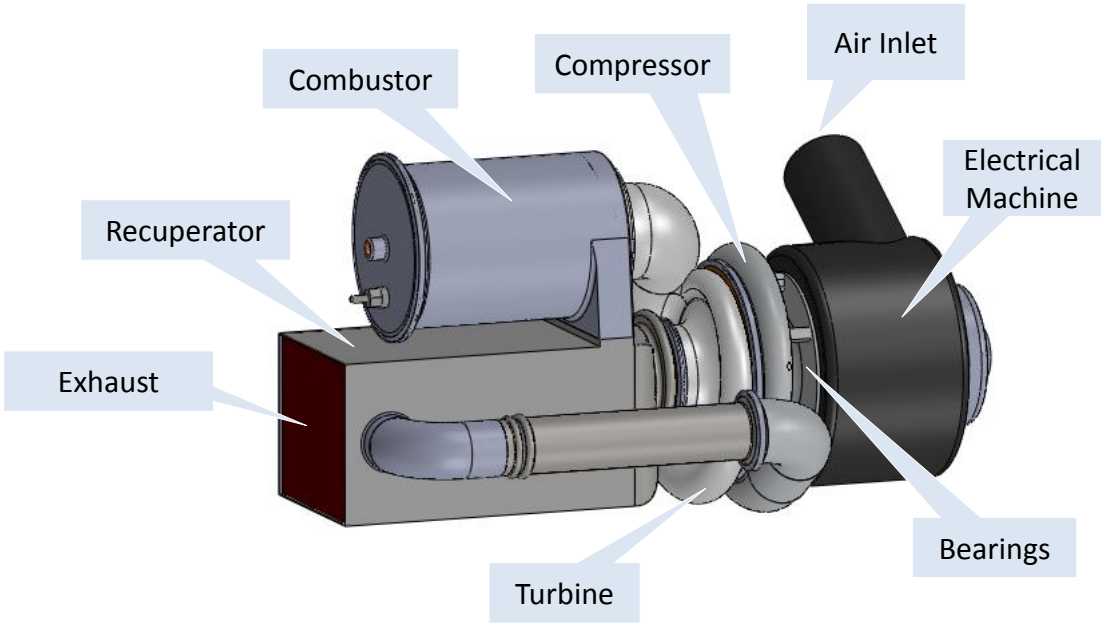
17kW Device

- "Innovate UK"-supported R&D program
- Targeted towards smaller, B/C segment cars and CDVs
- Interest from Nissan
- Potential for multi-fuel (CNG, hydrogen, gasoline)

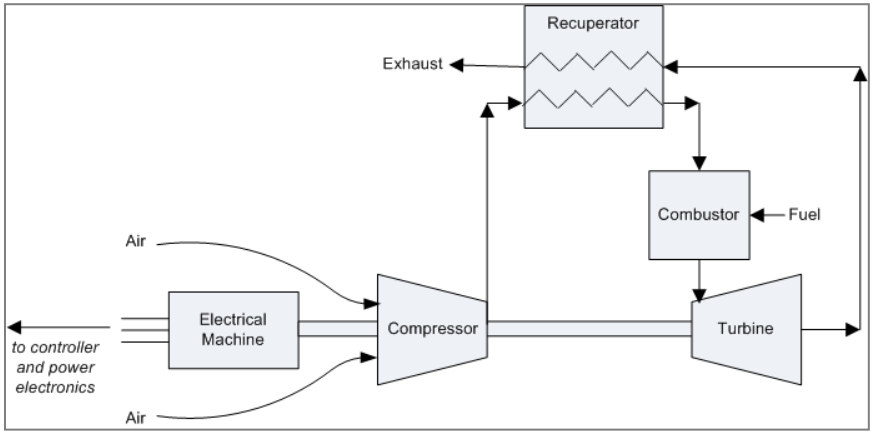
35kW Device

- Initial application in HIPERCAR program, with high profile sports car manufacturer
- Targeted towards larger cars

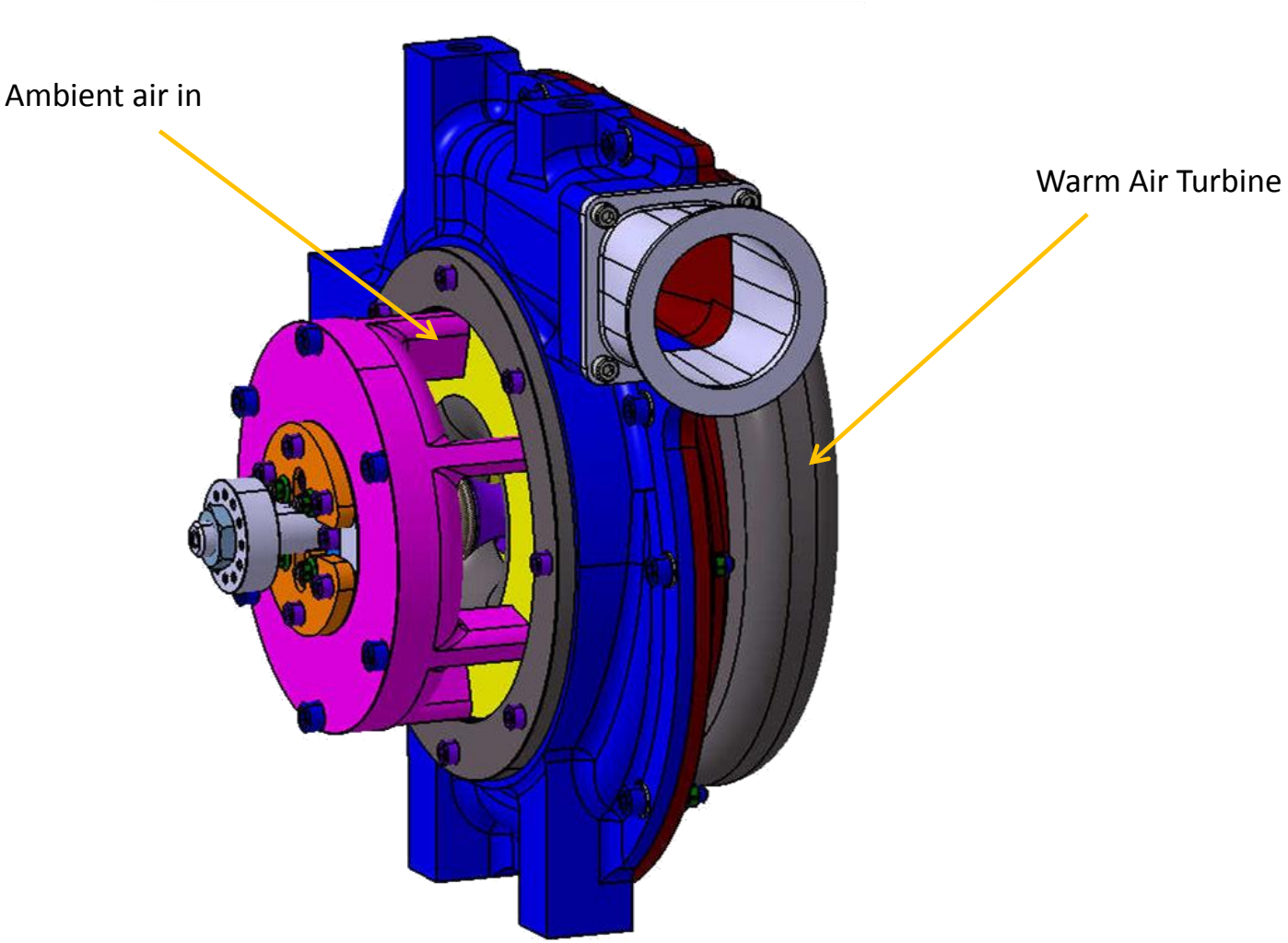
General unit overview



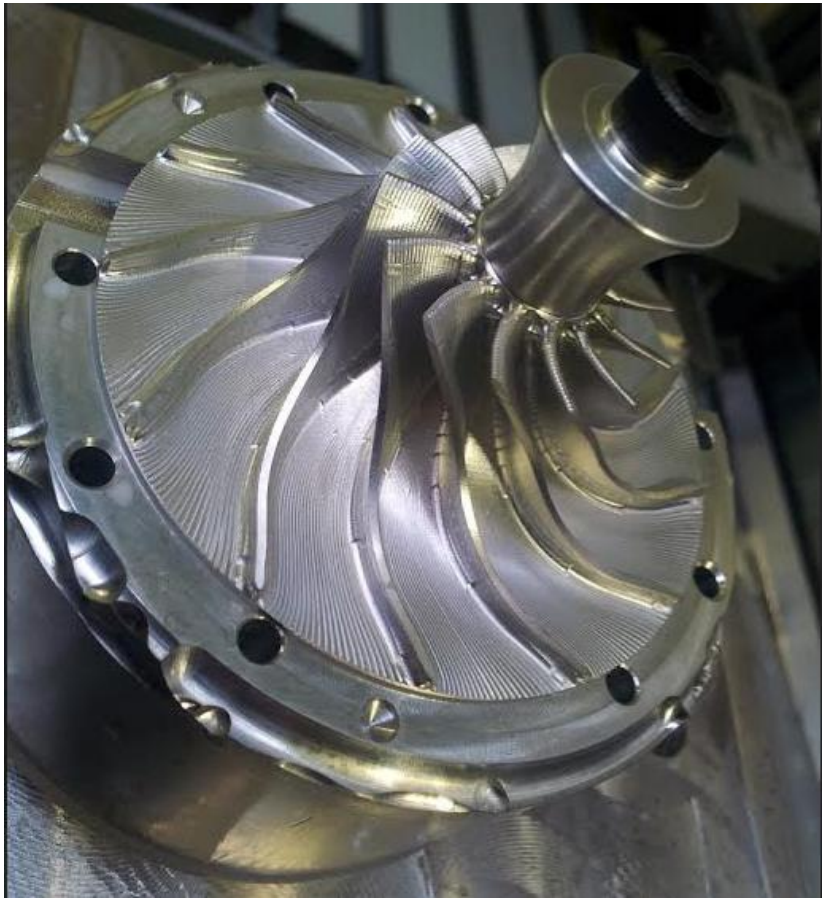
Power output	≥ 15kW
Overall efficiency	≥ 25 %
Fuel	Gasoline
Lifetime	≈ 2000 hours



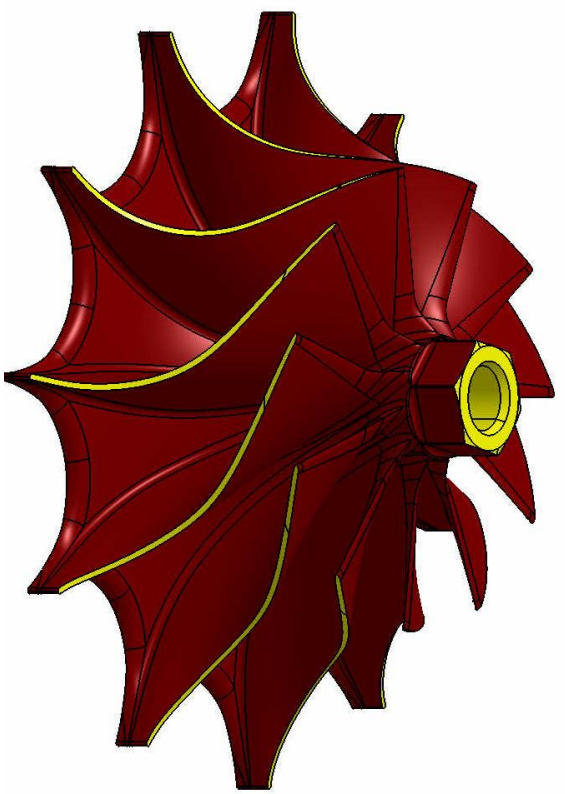
Compressor and Turbine Test Machine



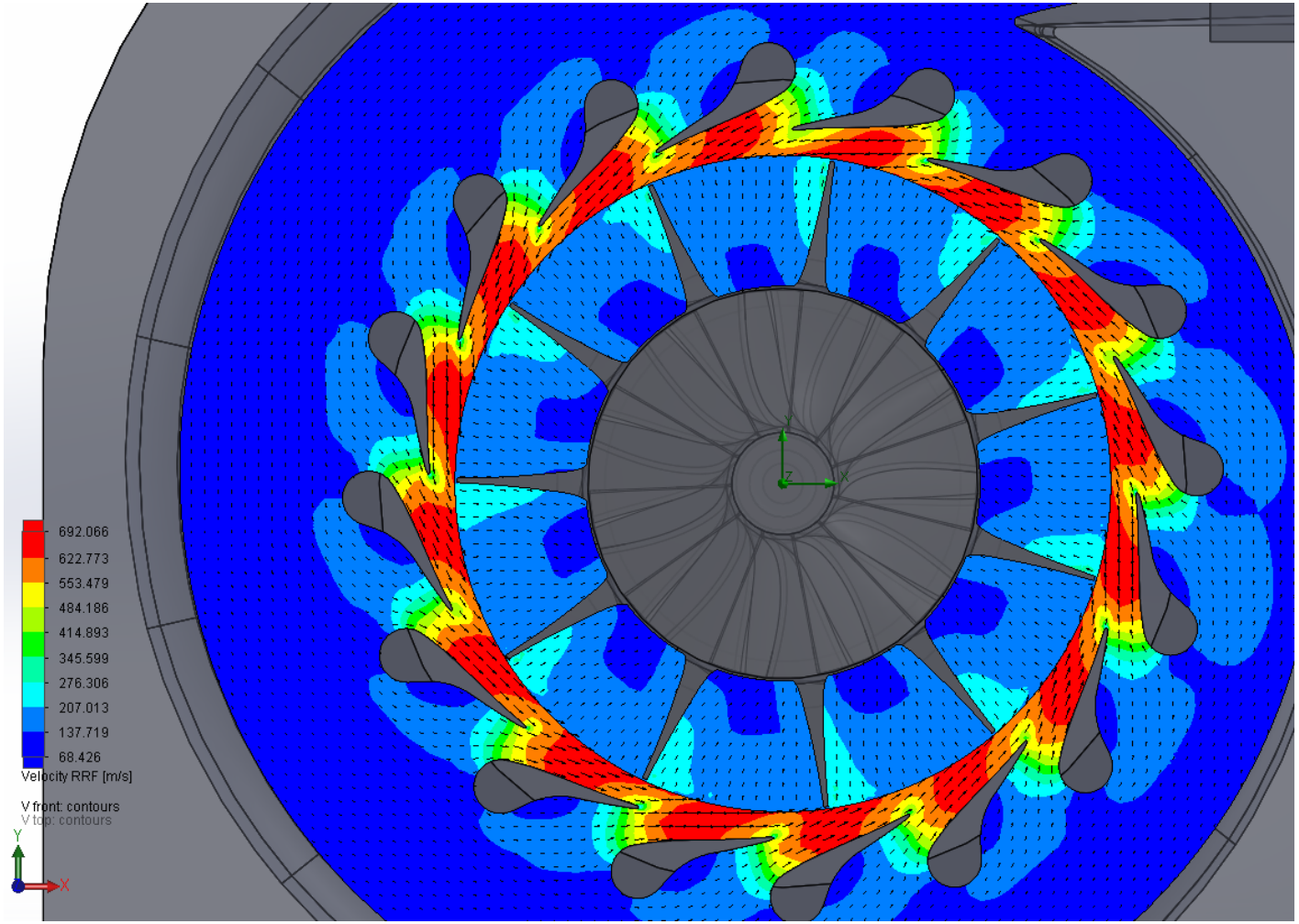
Compressor Wheel Machining



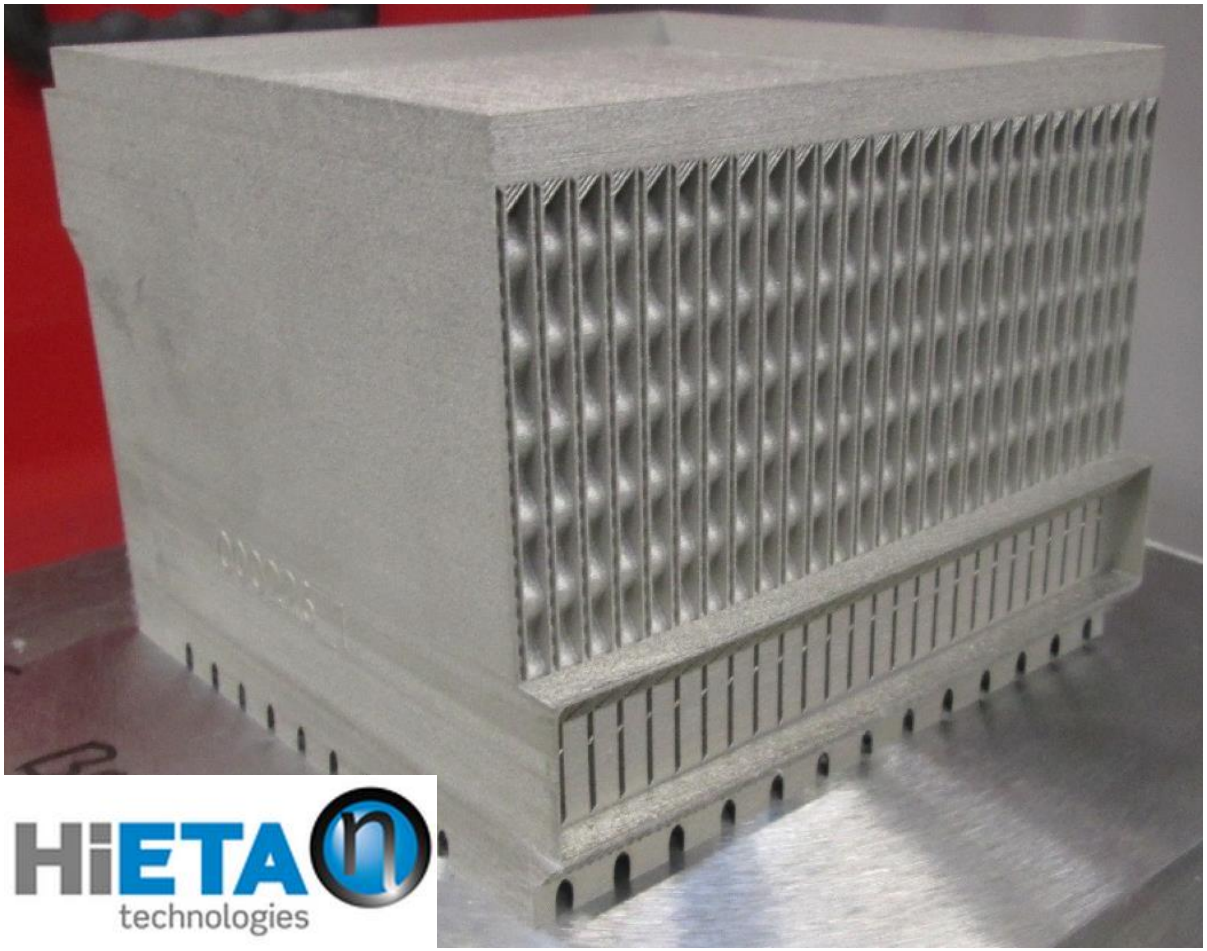
Turbine Wheel



Turbine CFD Result



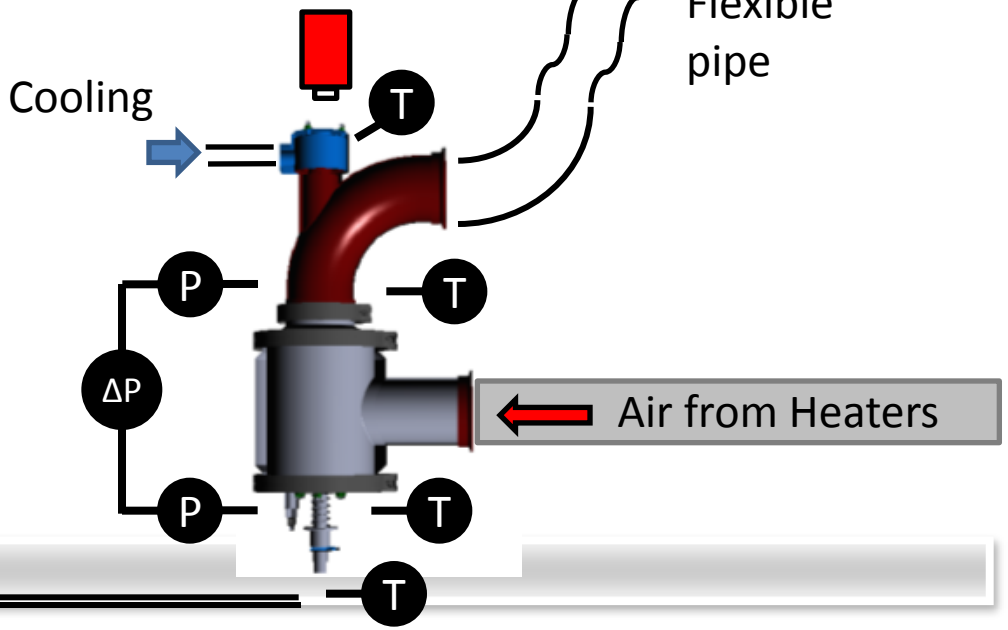
Additive Manufactured Recuperator Core



Test Combustor

Combustor Test Schematic

HORIBA EMISSIONS TOWER-



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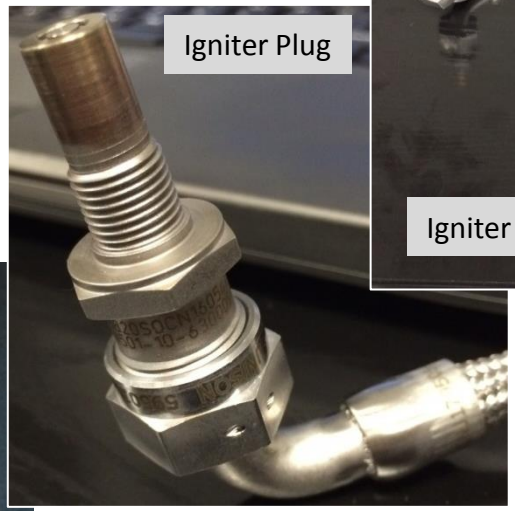
Variable Spark Ignition System

- Variable spark rate (1-10Hz).
- Up to 2 Joules stored energy



- Utilises aero-spec Igniter plug and Lead.
- Glow plug trials also planned for the combustor testing phase.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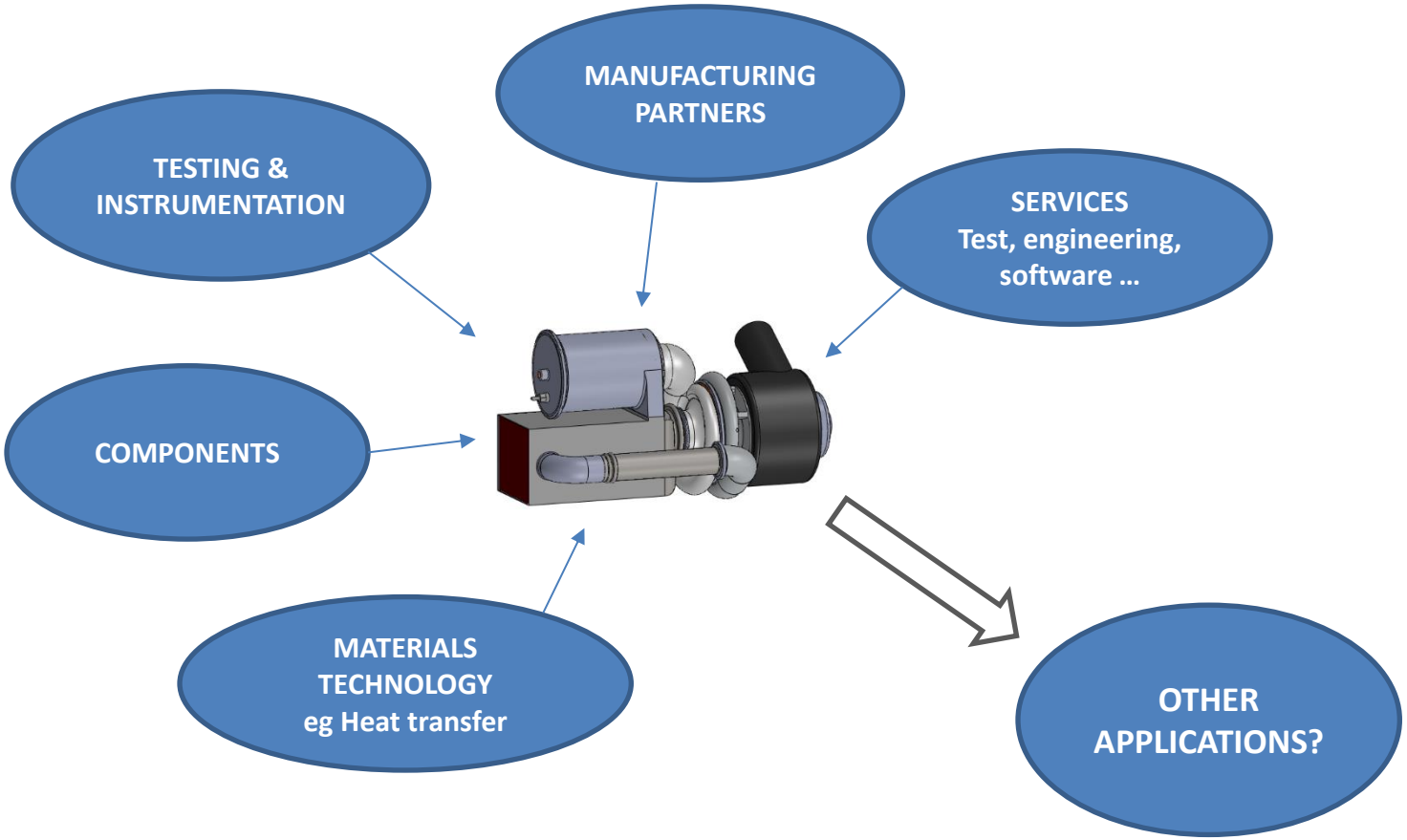
Combustor Test

Opportunities ?



Thanks for your attention !

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