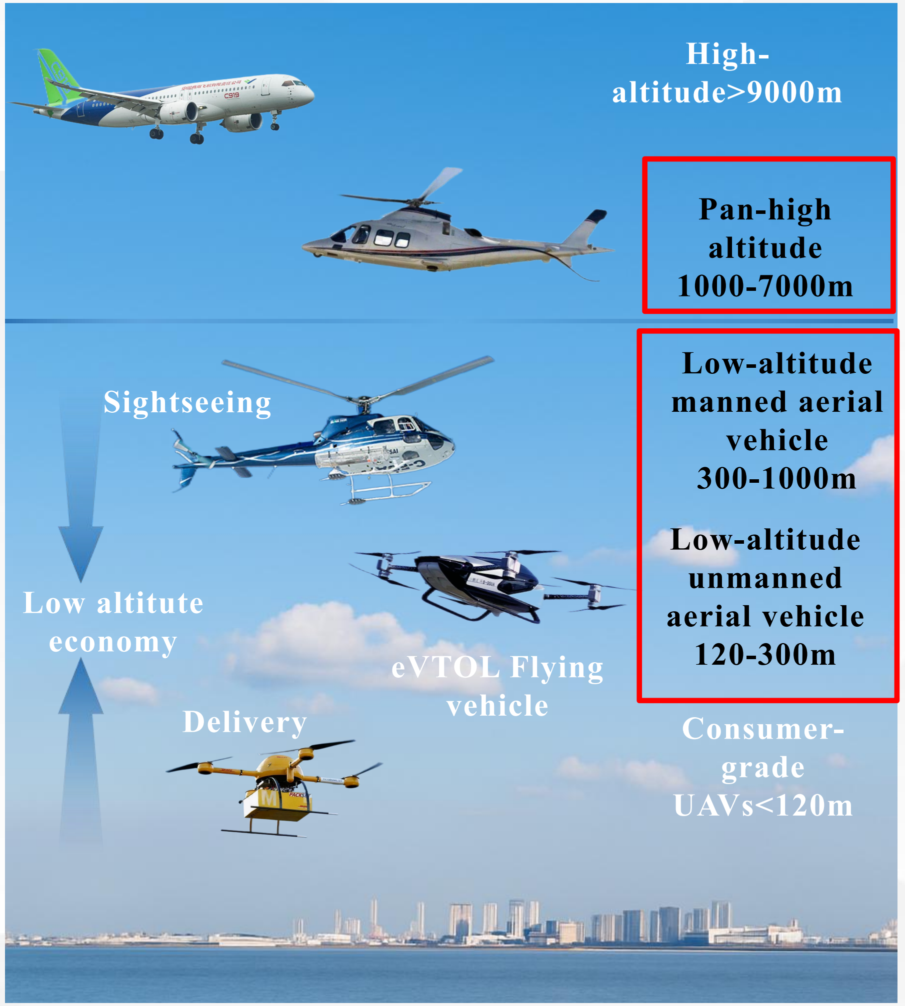
Aerospace Development Technology

Content

❑Aerospace Engine Development

Multi-scenario application platform

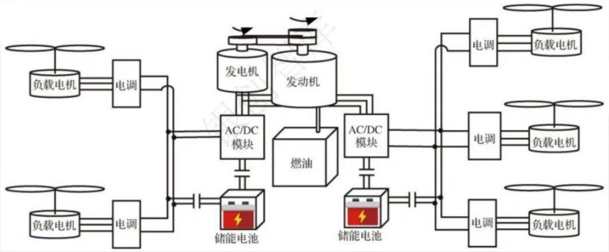


Regional aircraft Green transportation

- Piston engine matched with rotor
- Power-to-weight ratio exceeding 1.3.

eVTOL Flight range enhancement

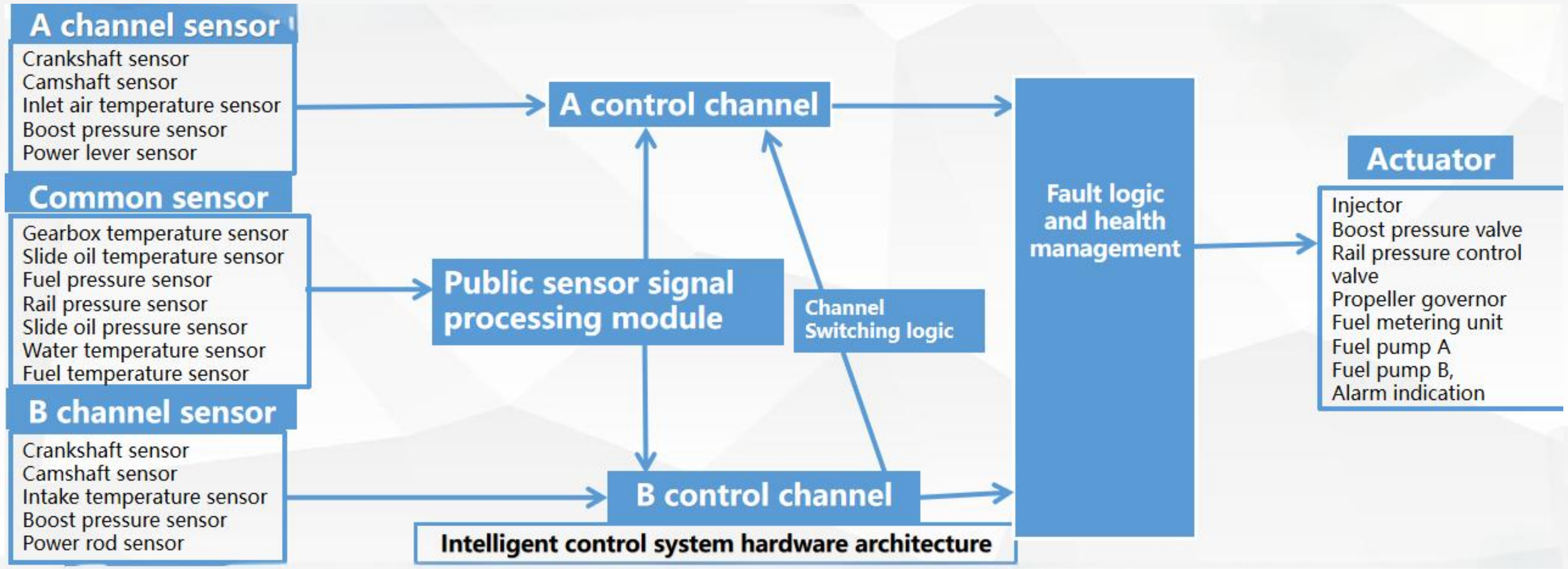
- Piston engine range-extender system
- Flight range improves above 400 km.
- 30% cost reduction

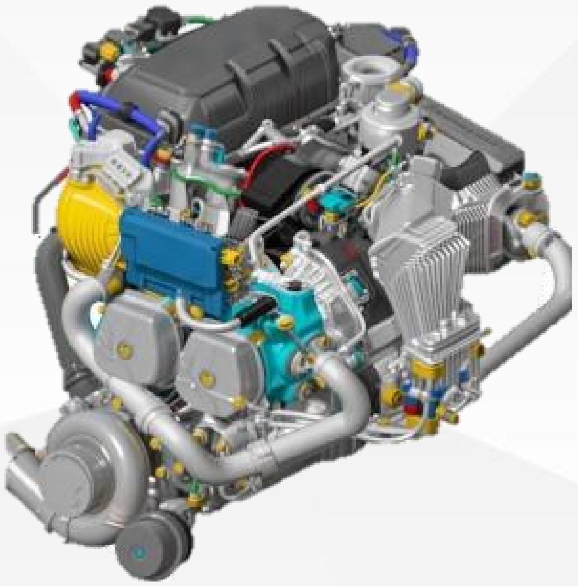


❑Aerospace Engine Development

Redundant Electronic Control Technology

Key technology	High security redundant control technology
Solutions	Full self-developed dual-redundancy system and sensor configuration



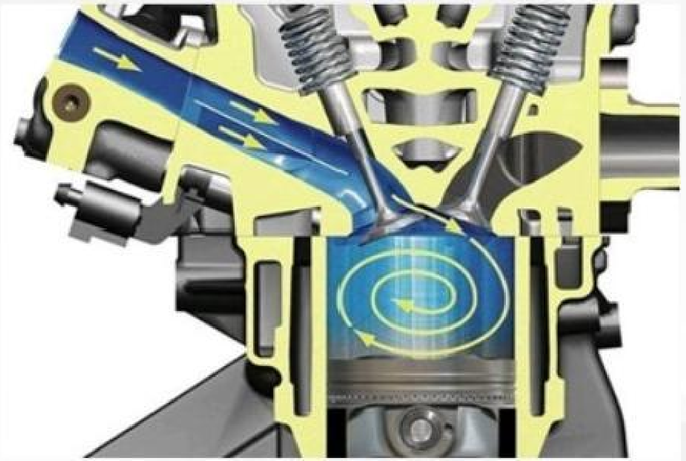


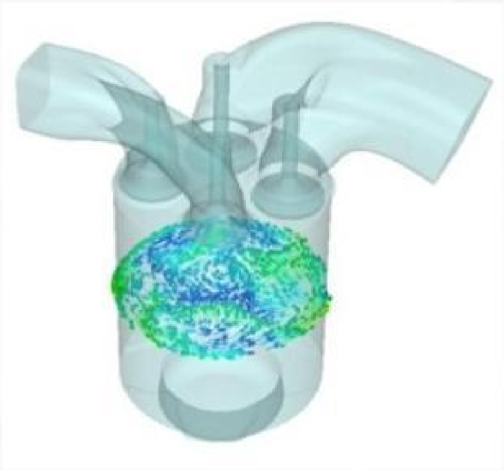
Intelligent control system hardware architecture

❑Aerospace Engine Development

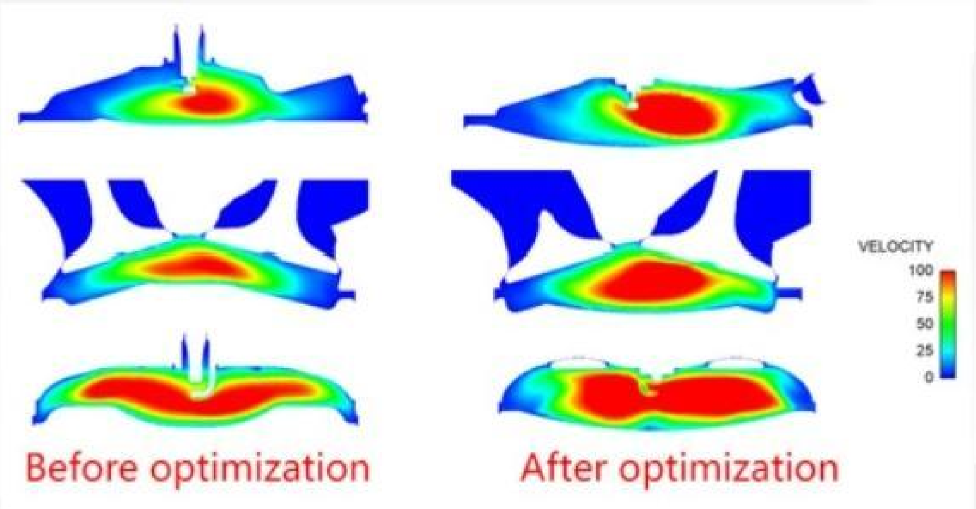
Combustion optimization

Key technology	Stable combustion organization and efficiency improvement under hypoxic environment
Solutions	The ventilation and combustion system are continuously optimized based on the high altitude environment model and combustion development experience.





Aerosol-cylinder combustion flow field simulation and optimization analysis



In-cylinder combustion optimization visualization and simulation analysis technology

❑Aerospace Engine Development

Lightweight design

Key technology	Lightweight core components
Solutions	CAE topology optimization and material substitution

Integrated flywheel motor-rotor lightweight design

Lightweight structure design based on CAE topology analysis

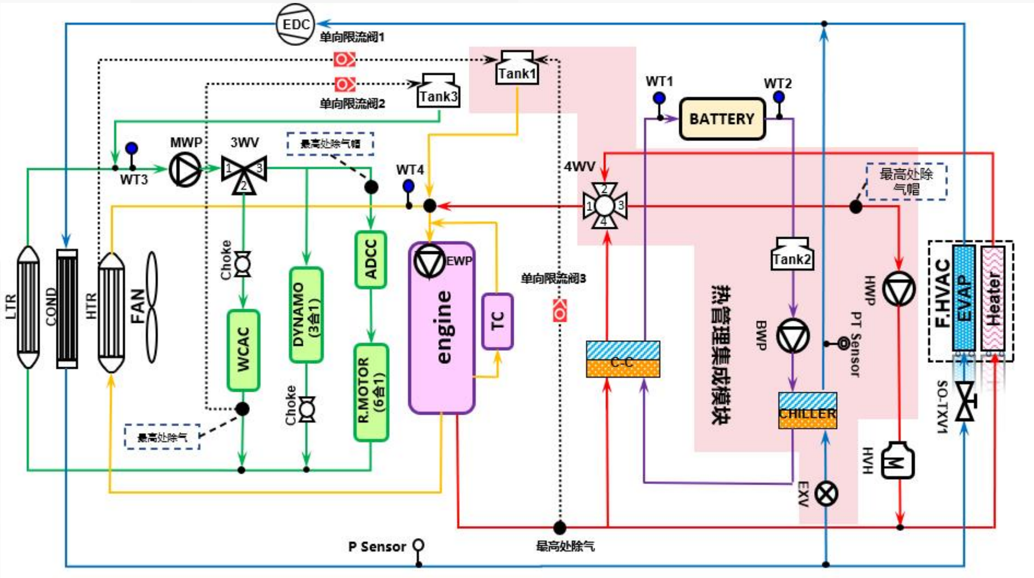
Hollow crankshaft lightweight design

❑Aerospace Engine Development

Airworthiness requirements

Key technology	Cooling lubrication sealing structure complex environmental requirements
Solutions	Model verification and test combination

Active lubrication design for dry-sump systems with high inclination angles



Thermal management architecture

❑Cooperation cases

Project Name： Model aircraft engine design and development

◆OEMs：

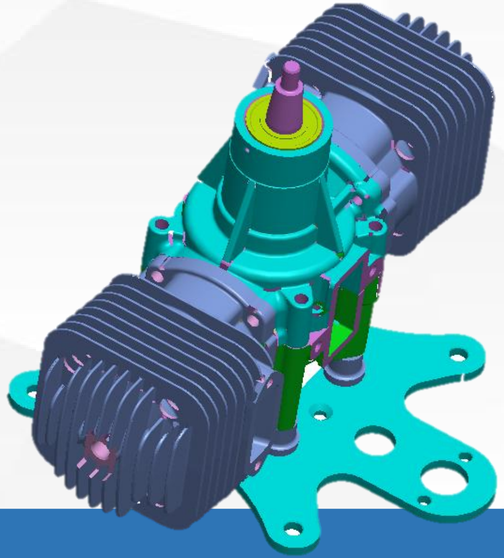
◆Cooperation period：2018~2019

◆Main technical features: Two-stroke and opposed twin-cylinder design.

◆Our work involves vehicle 3D and 2D design and CAE analysis.

◆ Current status：

1）Small-scale production has begun.



Number	Item	Opposed twin engine
1	Engine type	Opposed, twin-cylinder, naturally aspirated, air-cooled, two-stroke
2	Displacement（L）	0.264
3	Bore x Stroke（mm）	∅ 58×50
4	Rated power（kW/rpm）	16/7200
5	Combustion chamber compression ratio	10
6	Crankcase compression ratio	1.3
7	Jet method	Airway jetting
8	Ignition method	Spark ignition
9	Burst pressure（bar）	45

❑ Cooperation cases

Project Name: Design and development of the opposed two-cylinder engine

◆OEMs：

◆Cooperation period：2023

◆Main technical features: Two-stroke and opposed two-cylinder design.

◆Our work involves 3D and 2D design of the whole machine and CAE simulation.

◆Current status：

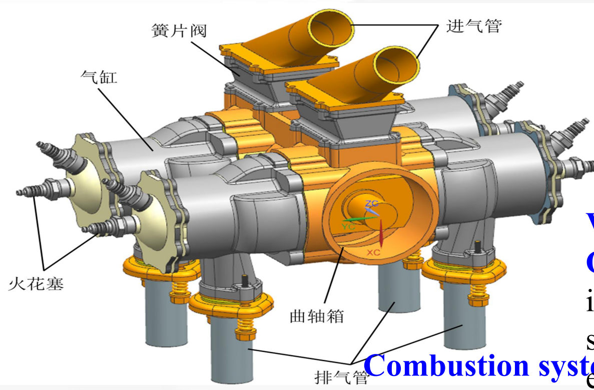
1）The drawing design has been completed.

2）Prototype is under test.

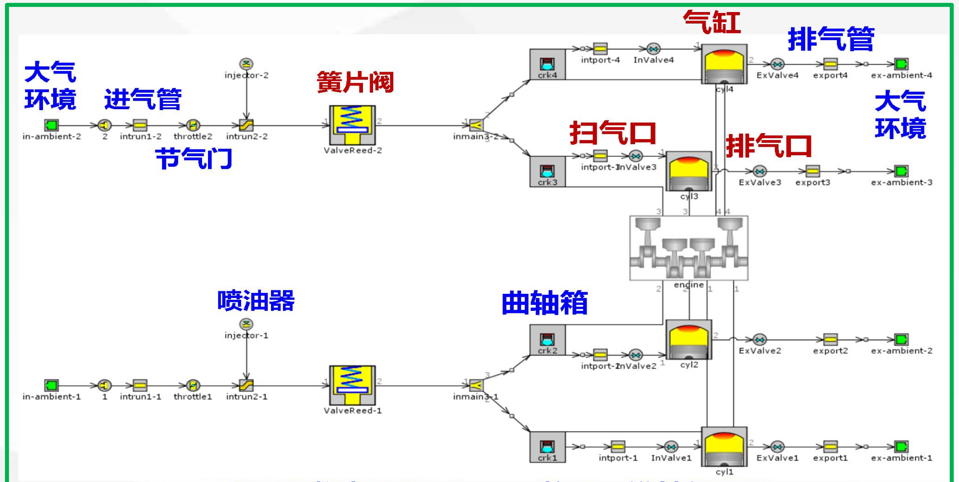
Index	Parameter
Structure	Horizontally opposed two-cylinder two-stroke
Bore×Stroke（mm）	76X69
Displacement（cc）	630
Maximum power(kW/rpm)	38
Fuel	≥93#
Lowest fuel consumption rate（g/kW.h）	≤385
Oil supply system	EFI

❑ Cooperation cases

- Carry out simulation research on the performance improvement of the XX engine of the UAV, and complete the optimization of the engine valve system and combustion system. After the optimization, the engine power performance increased by 22%, and the fuel economy improved by 21%. Correspondingly, the cruising altitude of the UAV was increased from 7,000 meters to 9,000 meters, which finally assisted the 365 Institute in solving the problem of insufficient cruising altitude and insufficient cruising distance of this type of UAV.



One-dimensional simulation of the performance of the whole machine



H9EC型发动机GT-Power整机一维性能模型

Valve System DOE Optimization

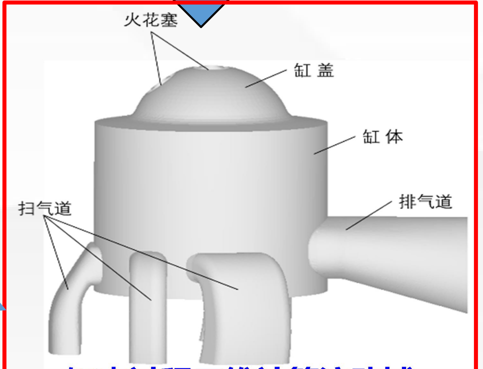
intake pipe diameter
scavenger area
exhaust port area
scavenging phase
exhaust phase

Combustion system optimization:

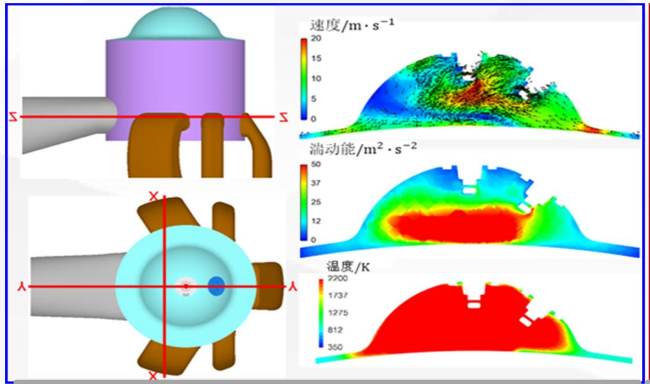
combustion chamber shape
Spark plug position.

3D simulation of the process in the cylinder

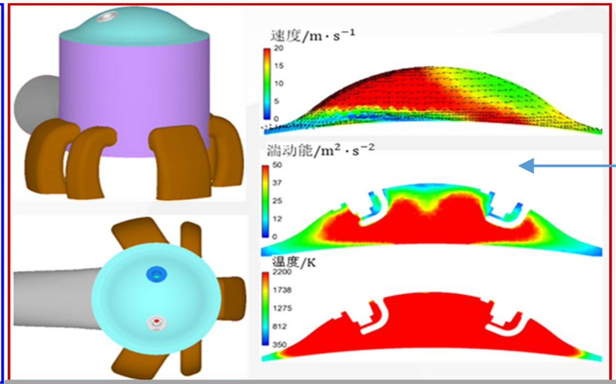
Three-dimensional calculation of the flow domain of the process in the cylinder



缸内过程三维计算流动域



Original combustion chamber and 3D simulation results



Optimization of the combustion chamber And 3D simulation results

❑Cooperation cases

Project name: Free piston engine design and development

◆Cooperation time: 2023

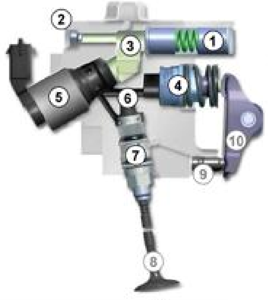
◆Main technical features: Opposed-piston, free-piston architecture with electromagnetic valves and linear motor.

◆Our work involves 3D and 2D design of complete machine, CAE simulation.

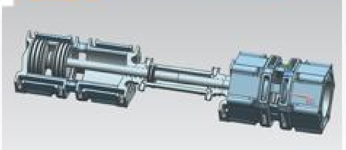
◆Current status:

1) The drawing design has been completed

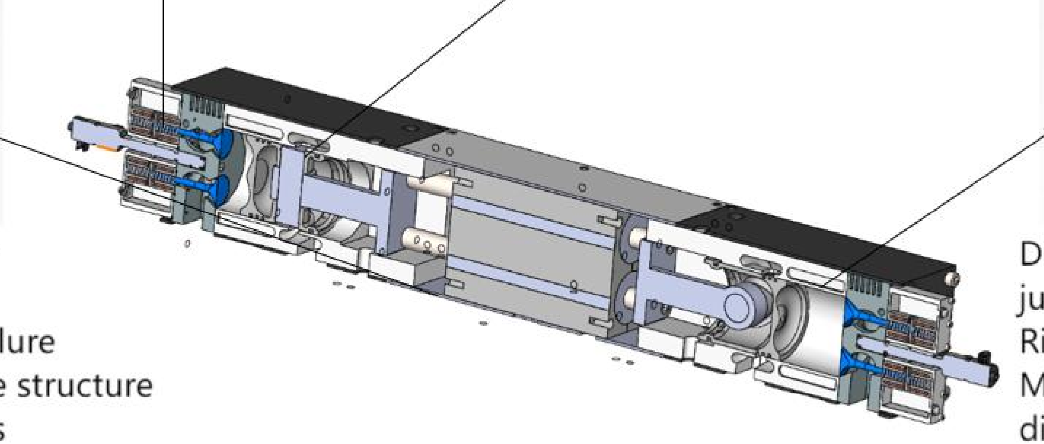
2) Complete the prototype test of the model

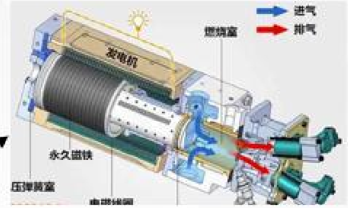


Solution: Electric drive exhaust valve
Difficulty: dimensional room, response
Resource: Schaeffler,Fulin Seiko



Difficulty: piston lubrication
Risk: oil consumption, pollutant control
Measures: other lubrication ceramic coating





Difficulty: opposed cylinder installation and coaxiality
Risk: abnormal wear and failure
Measure: the integral frame structure design and stiffness analysis

Difficulty: piston position judgement
Risk: cold start-up exhaust
Mearsure: clearance sensor distance sensor

❑ Cooperation cases

Project Name: Rotor Engine Development

◆Cooperation time: 2025

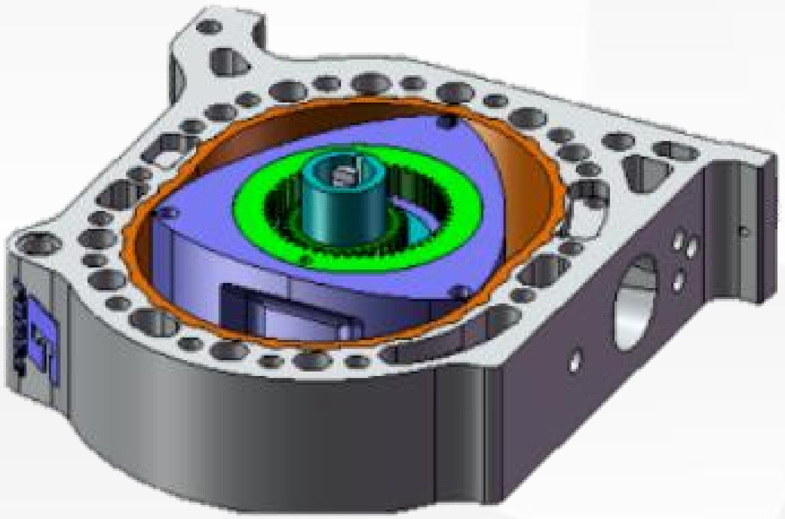
◆Main technical features: Rotor engine R&D

◆Our work involves 3D and 2D design of complete machine, CAE simulation.

◆Current status:

1) Structural design is in progress.

Number	Item	Rotary expansion engine
1	Engine type	Rotary expansion engine
2	Displacement （L）	1.3
3	Rated power (kW/rpm)	170/8000
4	Maximum torque (N.m/rpm)	210/5000
5	Weight（kg）	115



❑ Cooperation cases

Real 里尔汽车

Project Name：Aerospace engine design and development

◆OEMs：

◆Cooperation period：2023~

◆Main technical features: Two-stroke and opposed four-cylinder design.

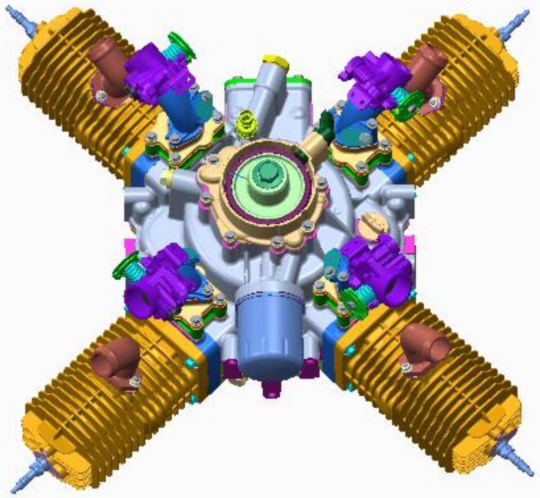
◆Our work involves vehicle 3D and 2D design and CAE simulation analysis.

◆Current status：

1) The drawing design has been completed

2) Complete the prototype test of the model is in progress.

Number	Item	Cross-four engine
1	Engine type	Crossed-over, 4-cylinder, naturally aspirated, air-cooled, two-stroke
2	Displacement（L）	1.5
3	Bore x Stroke（mm）	⌀ 75×75
4	Rated power（kW/rpm）	60/4000
5	Combustion chamber compression ratio	12
6	Crankcase compression ratio	1.35
7	Jet method	Airway jetting
8	Ignition method	Spark ignition
9	Burst pressure（bar）	60



❑ Cooperation cases

Project Name: Design and development of four-cylinder opposed engines

◆OEMs：

◆Cooperation period：2024

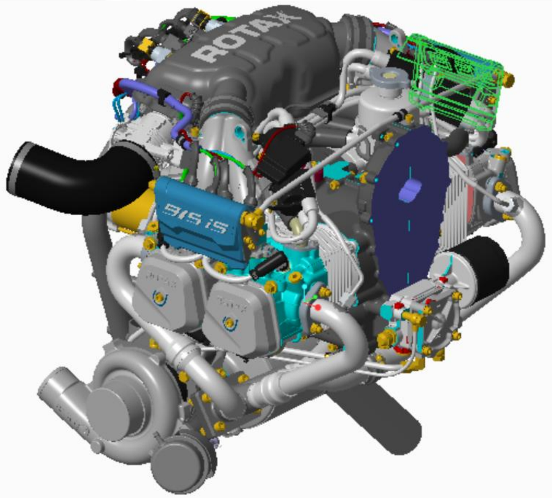
◆Main technical features: Four-stroke and horizontally opposed design.

◆Our work involves 3D and 2D design of the whole machine, CAE simulation

◆Current status：

1）The design of the 3D model of the competitor has been completed.

2）Detailed design is underway.



Number	Item	Aerospace engine
1	Type	4-cylinder、supercharged、air-cooled、4-stroke
2	Displacement（L）	1.415
3	Bore×Stroke（mm）	⌀ 84×61
4	Rated power（kW/rpm）	105/5800
5	Jet method	Airway jetting
6	Ignition method	Spark ignition

❑Cooperation cases

Project name: Aviation piston engine design and development

◆OEMs:

◆Cooperation period: 2025

◆Main technical features: Four stroke, direct injection and supercharge design.

◆Our work involves 3D and 2D design of complete machine, CAE simulation

◆Current status:

1) Complete the structural design.

2) The prototype is being reformed and tested.

Number	Item	Aerospace engines
1	Engine type	Four cylinders, supercharged, water cooled, four stroke
2	Displacement （L）	1.5
3	Bore × stroke (mm)	∅ 72×92
4	Rated power (kW/rpm)	135/5500
5	Injection method	Direct injection
6	Combustion method	Ignition
7	Weight(kg）	100

THANKS！

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