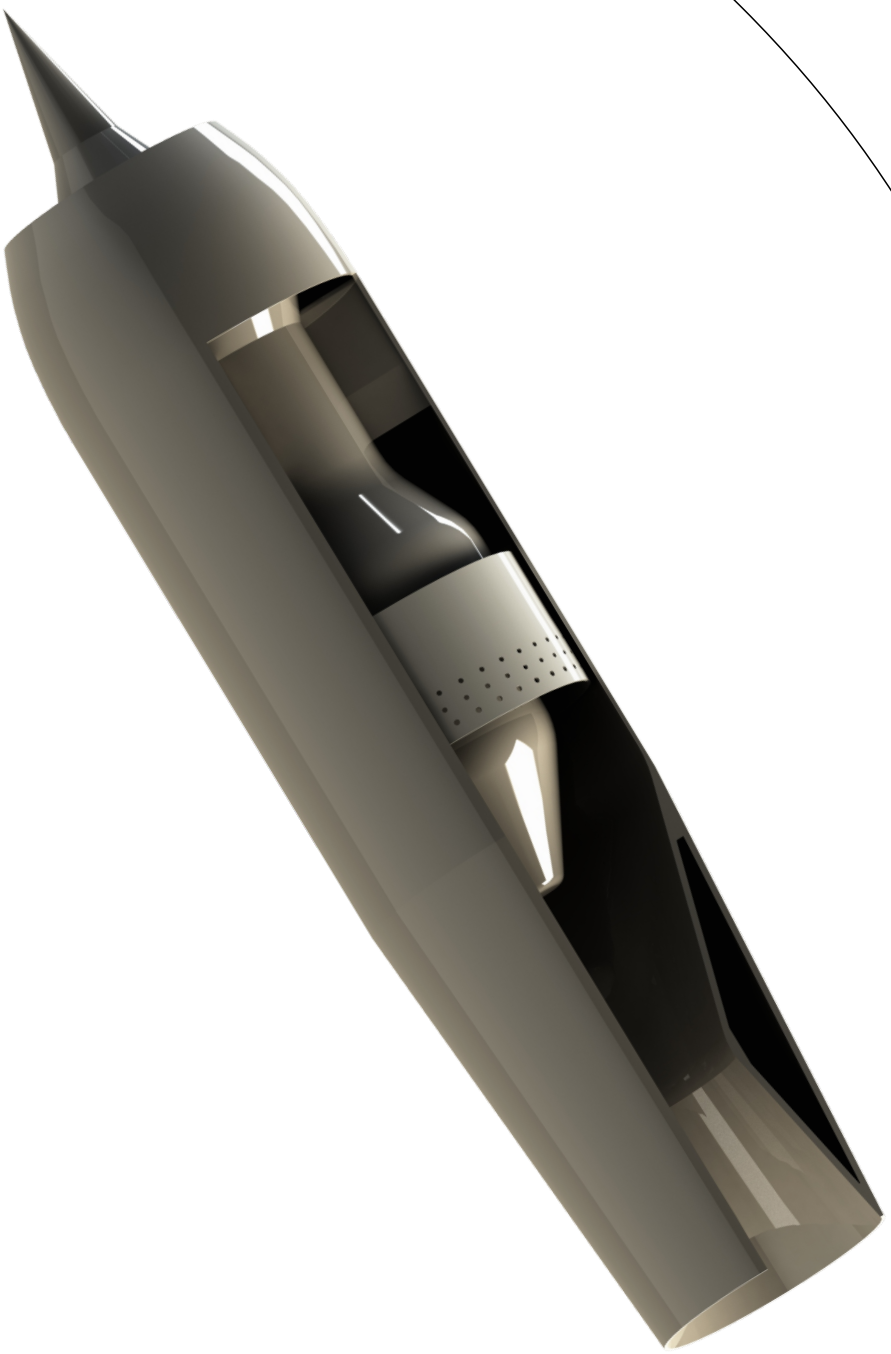
Łukasiewicz
Institute
of Aviation

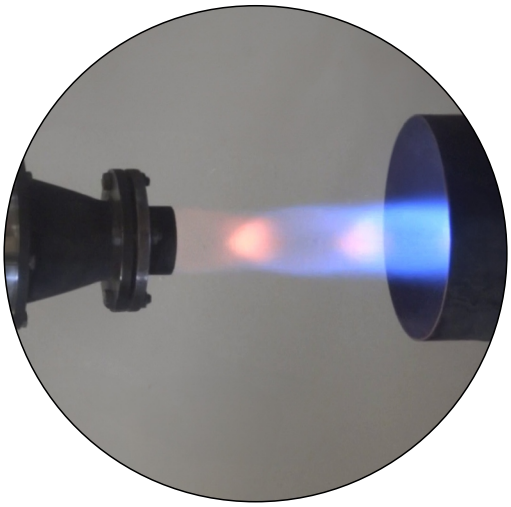


Innovative propulsion offering
benefits in efficiency,
environmental impact, and cost

ROTATING DETONATION ENGINE

CHARACTERISTICS

Rotating Detonation Engine (RDE) uses a detonation wave that propagates in an annular combustion chamber. Unlike traditional engines that use deflagrative combustion, RDE achieves higher energy efficiency by harnessing the energy generated by the detonation wave. This technology allows reducing fuel consumption and lower emissions, while also enabling the miniaturization of the propulsion system. Engineers at the Łukasiewicz Research Network – Institute of Aviation have successfully developed several RDE concepts. In 2021, the Institute's RDE rocket engine was the first in the world to be flight-tested as the first stage of a small research rocket. Currently, the expansion of the RDE test facilities is underway, which will enable the testing of large air-breathing engines for military applications as well as larger, advanced rotating detonation rocket engines.



CONCEPTS

RDE concepts developed at łukasiewicz – Institute of Aviation:

- **Airbreathing RDEpowered** by hydrogen (TRL 4) for turbine engine propulsion.
- **Rocket RDE** using rotating detonation on liquid propellants (TRL 6).
- **Ramjet engines** powered by liquid fuels (kerosene, gasoline) for use in supersonic missiles.

KEY FEATURES

- High energy efficiency.
- Increased speed and range.
- Environmentally friendly – reduced emissions.
- Fuel consumption reduction.
- Compact design.
- Capability to use various fuels.

POSSIBLE APPLICATIONS

- **Aviation:** Engines for long-range passenger and cargo aircraft.
- **Space Industry:**
  - Eco-friendly rocket propulsion.
  - Engines for spacecraft and interplanetary probes.

  Defense Industry:
  - Applications in cruise missiles and other advanced weapons systems.
  - Rocket missiles capable of achieving supersonic and hypersonic speeds.
  - Propulsion for fighter jets and bombers.
- **Energy Industry:** RDE-based turbogenerators powered by gaseous hydrogen.

The Łukasiewicz Research Network – Institute of Aviation
offers a wide range of specialized research, engineering services and products. We provide comprehensive solutions, ranging from dedicated analyzes, simulations, engineering design, through the selection, testing and certification of materials and structures, to rapid prototyping and additive manufacturing.

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