



Łukasiewicz
Institute
of Aviation

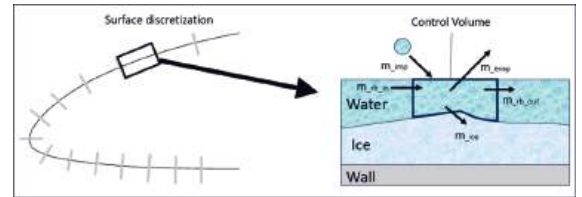


SOPEL **DESIGN OF** **ANTI-ICING** **SYSTEMS FOR** **UNMANNED** **VEHICLES**

CHARACTERISTICS

Łukasiewicz – Institute of Aviation offers state-of-the-art methods and tools for designing anti-icing systems. The Institute's expertise and experience enhance the operational capabilities of unmanned aerial vehicles in challenging weather conditions, improving safety and reliability.

Mass Expenditure Balance for a Discretized Cell on the Airfoil



$$\dot{m}_{imp} + \dot{m}_{rb_in} = \dot{m}_{ice} + \dot{m}_{rb_out} + \dot{m}_{evap}$$

where:

\dot{m}_{imp} – the impact of a drop of water
 $\dot{m}_{(rb_in)}$ – inflow water droplets

\dot{m}_{ice} – freezing water droplets
 $\dot{m}_{(rb_out)}$ – runoff water droplets
 \dot{m}_{evap} – evaporation water droplets

Hardware:

Development of a technological design for UAV anti-icing system integration

Design of a dedicated power controller

Software:

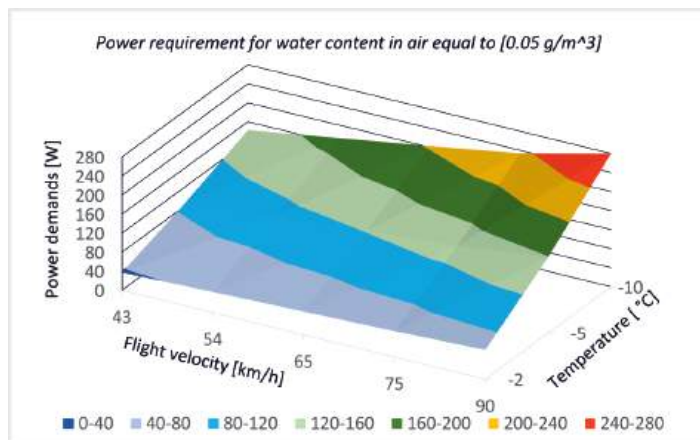
Numerical modeling of the icing phenomenon

Autonomous anti-icing system control software

Environmental Testing:

Development and execution of experimental research

Flight tests



TECHNICAL DATA

The system is custom-designed to meet the specific requirements of the client, tailored to the wing profile, mission profile, and available power supply of the UAV. Numerical modeling and environmental testing enable power demand optimization while ensuring sufficient heating capacity minimizing system weight.

KEY FEATURES

Addresses critical icing challenges in unmanned aviation.

Preventing:

- Loss of lift force.
- Increased aerodynamic drag.
- Growth of UAV mass during flight due to ice accumulation.

Mitigates risks such as:

- Malfunction of measurement and navigation systems.
- Disruptions in stability and controllability.



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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