

Project Title: International Joint Research and Development of Airflow Control Devices for High Efficiency and Performance of Aircraft (2023—2026*)

*scheduled



Entrusted Parties: Toyota Technological Institute (TTI)/ Aichi Institute of Technology (AIT)/ Tokyo Denki University(TDU)/ Tokai National Higher Education and Research System (Nagoya University (NU))/ Waseda University (WU)

Outline of the Project

• Background

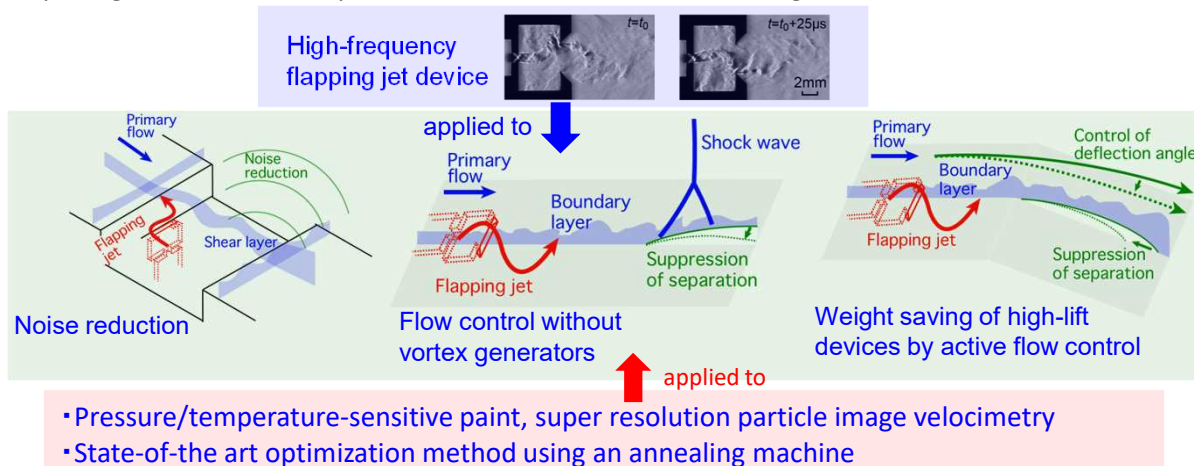
For the realization of a low-carbon and sustainable society, it is necessary to significantly improve the efficiency of reduction in aerodynamic drag and reduce the weight of high-lift devices as well as reducing the noise of aircraft that are subject to compressible high-speed flows around them.

• Objective

The aim of this project is to develop aerodynamic flow control methods that lead to higher efficiency and lower noise for electric and hydrogen aircrafts by using new high-frequency flapping jet generation devices (operating frequency: several tens of kHz).

• Research strategy

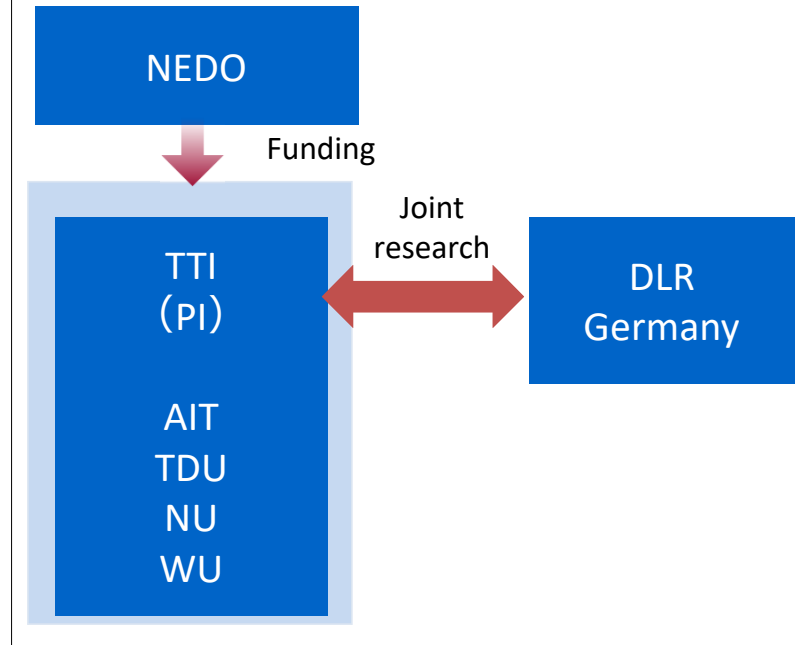
Advanced flow diagnostic systems will clarify the phenomena appearing in high-speed flows around the aircraft, which cause noise and aerodynamic drag force, to be controlled by new devices. High-efficiency and high-performance airflow control methods will then be established by using state-of-the-art optimization methods with an annealing machine.



Significance of International R&D

In collaboration with the German Aerospace Center (DLR), verification tests will be carried out using DLR's full-scale Reynolds number wind tunnel (cryogenic Ludwieg tube) for verifying methods to control new devices developed and optimized by a domestic research group.

Project Scheme



Expected Outcomes

- Social impact
 - Replacing vortex generators with the new device
→ 1 to 2% reduction in aerodynamic drag
 - Weight saving of high-lift device by flow control
→ Aircraft weight reduced by 1%
- CO₂ reduction
 - 8 to 12 million tons CO₂ per year
- Economic impact
 - 420 to 640 billion JPY per year