

Cooperative Research on Airframe Noise Reduction Technology (FQUROH+) #1

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● Abstract

This collaborative research is being carried out as part of the FQUROH (Flight Demonstration of Quiet Technology to Reduce Noise from High-Lift Configurations) project aimed at raising the technical maturity level of the noise reduction technology for high-lift devices and landing gear, which draws international attention to reduce noise in areas around airports, to a level applicable to future development of aircraft and related equipment. This contributes to reduction of aircraft noise in local communities around the airport and airline operating costs by reducing landing fee.

Ref. URL: <http://www.aero.jaxa.jp/eng/research/ecat/fquroh/>

● Reasons and benefits of using JAXA Supercomputer System

The JSS2 enabled low-noise devices to be designed based on Reynolds-averaged Navier-Stokes simulations and more advanced computational simulations, such as large eddy simulations, using the Kawasaki Heavy Industries (KHI)-developed unsteady computational fluid dynamics software, "Cflow." Computational simulations using the JSS2 made it possible to design low-noise devices by understanding detailed physical phenomena, which were difficult only with wind tunnel tests.

● Achievements of the Year

In order to design noise reduction devices for passenger aircraft in the FQUROH project, CFD simulations of the "OTOMO2" high-lift model were carried out using the KHI in-house unsteady CFD software called "Cflow." The focus here is on slat side edge noise; the computational result for the baseline configuration helped us come up with noise reduction concepts as well as understand noise generation mechanisms. The effect of noise reduction devices was also evaluated by unsteady CFD analyses.

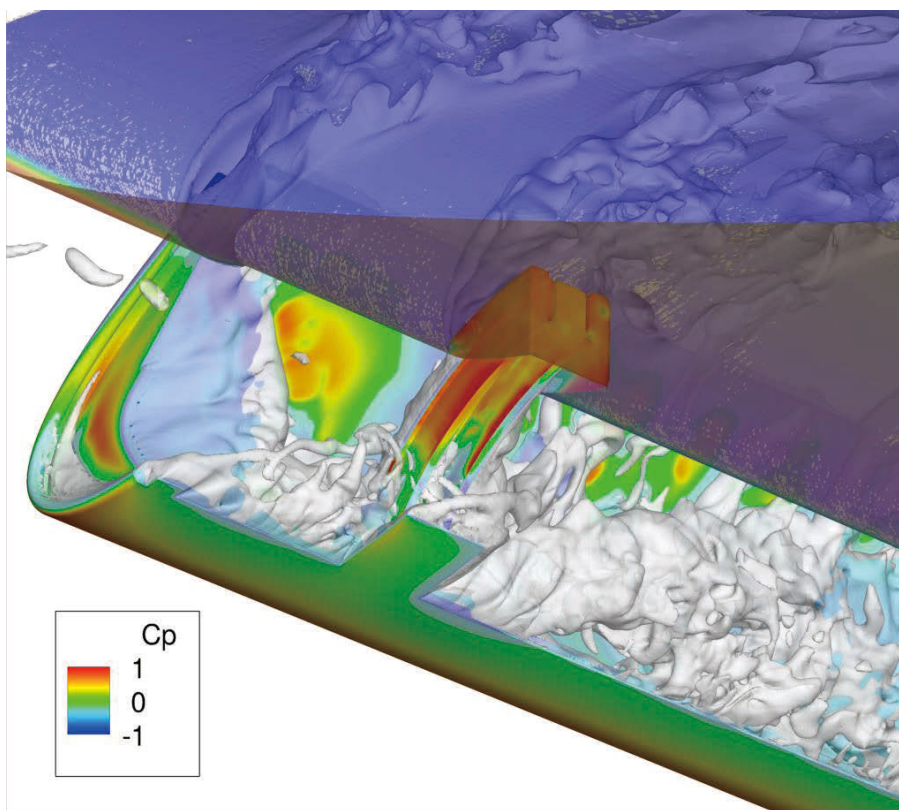


Fig. 1: Unsteady CFD analysis around slat side edge of OTOMO2 high-lift model

● **Publications**

- Non peer-reviewed papers

1) Ueno, Y., Isotani, K., Hayama, K., Takaishi, T., Ito, Y., Yokokawa, Y., Murayama, M., and Yamamoto, K., "Validation of Noise Reduction Design for Landing Gear in the FQUROH Flight Demonstration Project," AIAA Paper 2019-2506, 25th AIAA/CEAS Aeroacoustics Conference, Delft, the Netherlands, May 2019, DOI: 10.2514/6.2019-2506.

- Invited Presentations

1) Yamamoto, K., "A Flight Demonstration Project for Airframe Noise Reduction Technologies, FQUROH," Asia Pacific International Symposium on Aerospace Technology (APISAT) 2019, Gold Coast, Australia, December 2019.

● **Usage of JSS2**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	4096
Elapsed Time per Case	120 Hour(s)

- **Resources Used**

Fraction of Usage in Total Resources*1(%): 0.50

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2(%)
SORA-MA	4,398,168.75	0.53
SORA-PP	0.00	0.00
SORA-LM	0.00	0.00
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2(%)
/home	70.36	0.06
/data	13,093.87	0.22
/ltmp	7,322.00	0.62

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2(%)
J-SPACE	109.78	2.76

*1: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

*2: Fraction of Usage : Percentage of usage relative to each resource used in one year.