# Cooperative Research on High Lift Devices in the FQUROH Project

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## Abstract

This collaborative research is being carried out as part of the FQUROH project aimed at raising the technical maturity level of the noise reduction technology for high-lift devices, 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.

http://www.aero.jaxa.jp/eng/research/ecat/fquroh/

## Reasons for using of JSS2

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 unsteady computational fluid dynamics software, "Cflow," developed by the Kawasaki Heavy Industries (KHI). Computational simulations using the JSS2 made it possible to design low-noise devices by understanding detailed physical phenomena, which was difficult only with wind tunnel tests.

## Achievements of the Year

For the second flight demonstration on airframe noise reduction technologies with JAXA's jet research aircraft "Hisho," KHI modified the KHI-designed flap noise reduction devices called "Small Barriers," by adjusting their location, size and number. The effect of the modified devices was examined with the KHI-developed unsteady computational fluid dynamics software, "Cflow." It was found that the modified devices contributed to further reducing flap noise.

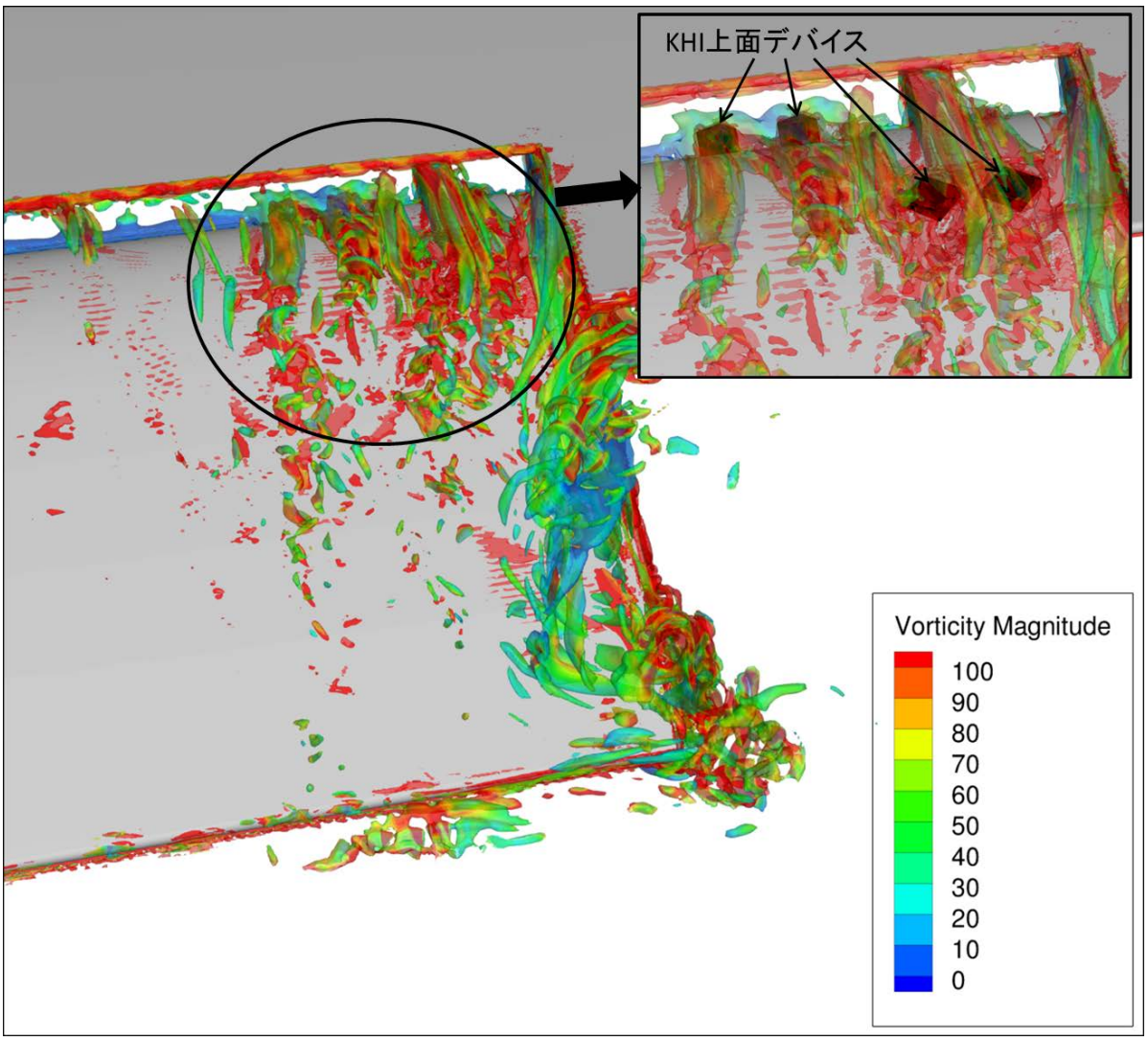


Fig.1 Lambda$_2$ isosurface colored by vorticity magnitude around the most outboard flap tip of "Hisho" based on unsteady CFD analysis

## Publications

- Non peer-reviewed papers

1) Yamamoto, K., Takaishi, T., Murayama, M., Yokokawa, Y., Ito, Y., Arizono, H., Sakai, R., Shoji, H., Ueno, Y., Isotani, K., Lee, H.-H., Inoue, T. and Kumada, T., ""FQUROH: A Flight Demonstration Project for Airframe Noise Reduction Technology - the 1st Flight Demonstration,"" AIAA Paper 2017-4029, 23rd AIAA/CEAS Aeroacoustics Conference, Denver, CO, 2017, DOI: 10.2514/6.2017-4029.

## Usage of JSS2

### Computational Information

| | |
|---|---|
| Parallelization Methods | MPI |
| Thread Parallelization Methods | N/A |
| Number of Processes | 2048 |
| Elapsed Time per Case | 80.00 hours |

### Resources Used

Fraction of Usage in Total Resources*1 (%): 0.12

Details

| Computing Resources | | |
|---|---|---|
| System Name | Amount of Core Time (core x hours) | Fraction of Usage*2 (%) |
| SORA-MA | 754,953.51 | 0.10 |
| SORA-PP | 22.06 | 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 | 061.84 | 0.04 |
| /data | 13,815.67 | 0.26 |
| /ltmp | 7,559.72 | 0.57 |

| Archiver Resources | | |
|---|---|---|
| Archiver System Name | Storage used(TiB) | Fraction of Usage*2 (%) |
| J-SPACE | 89.59 | 3.85 |

*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