Research and Development on Airframe Noise Reduction Technology (FQUROH-2) #1

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Responsible Representative

Takashi Aoyama, Program Director of Aviation Technology, Aviation Technology Directorate

Contact Information

Takehisa Takaishi, FQUROH-2 Project Team (Airframe Noise Reduction Technology Project Team), Aviation Technology Directorate(takaishi.takehisa@jaxa.jp)

Members

Takehisa Takaishi, Mitsuhiro Murayama, Yasushi Ito, Takashi Ishida, Yoimi Kojima, Kazuomi Yamamoto, Kentaro Tanaka, Tohru Hirai, Gen Nakano, Manabu Hisida

Abstract

In order to meet the projected demand for air travel, strengthen the international competitiveness of Japan's airports, and improve passenger convenience, major airports are considering increasing the number of takeoffs and landings. To achieve noise reduction in the areas surrounding airports even with the expected increase in the number of takeoffs and landings, it is necessary to increase the maturity of the technology for reducing airframe noise generated by high-lift devices and landing gear. In this project, we have developed a flight test plan using a commercial aircraft to demonstrate airframe noise reduction as part of activities aimed at practical development of airframe noise reduction technology. Computational simulations were used to verify the feasibility of practical noise reduction concepts and design methods. This computational activity is to evaluate a new advanced large-scale computational simulation method that is being developed.

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

Reasons and benefits of using JAXA Supercomputer System

The JSS3 enabled a large number of high-fidelity Reynolds-averaged Navier-Stokes (RANS) simulations with aerodynamically-important details in several flight configurations in the expected flight envelop to be conducted in a timely manner. The aerodynamic effect of low-noise devices can be evaluated and quantified, which is difficult to obtain only with wind tunnel tests.

Achievements of the Year

As an improvement of CFD technology for evaluating the effectiveness of aircraft noise reduction, an immersed boundary method was attempted to be implemented for the unstructured solver FaSTAR, which eliminates the

need for a high-density mesh near the object by modeling the boundary layer on the object and dramatically reducing the analysis time. As an initial verification, Reynolds-averaged Navier-Stokes simulations were performed with two- and three-dimensional airfoils, and the results were compared with those of conventional simulations using a high-density mesh near the object to identify areas for improvement.

Publications

N/A

Usage of JSS

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	8 - 24
Elapsed Time per Case	20 Minute(s)

JSS3 Resources Used

Fraction of Usage in Total Resources[*1](%): 0.00

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	61,096.76	0.00
TOKI-ST	1,341.17	0.00
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	0.00	0.00
TOKI-TGP	0.00	0.00
TOKI-TLM	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2 (%)
/home	65.71	0.05
/data and /data2	15,079.28	0.09
/ssd	720.82	0.07

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	383.91	1.38

*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.

- **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage*2 (%)
ISV Software Licenses (Total)	1.28	0.00

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