Innovative Green Aircraft Technology : High Efficiency and Low Noise Aircraft

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Abstract

The purpose of the iGreen research is to develop and mature a bunch of advanced and innovative technologies on aerodynamics, aeroacoustics, and structures to enable airframe design with higher environmental performances. In addition to verifying practical application of these technologies, we will also work on the development of elemental and system technologies.

Ref. URL: https://www.aero.jaxa.jp/eng/research/ecat/igreen/

Reasons and benefits of using JAXA Supercomputer System

CFD analysis are used for the understanding of aerodynamic characteristics and evaluation of the performance in the aircraft design phase. Huge calculation resources and costs were required for the high fidelity and quick response CFD analysis for the optimum aerodynamic design process on complex aircraft geometry. JSS3 can achieve those requirements, the cost and time are drastically saved on the CFD analysis.

Achievements of the Year

Collaborative research activities with universities have been conducted for aerodynamic technologies to improve the environmental performances of subsonic aircraft such as low fuel consumption and low noise. In this year, in order to control the shock-wave structure and flow separation caused by the shock-boundary layer interaction, flow behaviors and aerodynamic characteristics to suppress of shock-wave strength and flow separation were understood using several shapes of aerodynamic device attached on the wing by numerical analysis. Design guideline for aerodynamic devices to control the shock-wave for improvement of aerodynamic characteristics were obtained.

Publications

- Oral Presentations

Nozomu Hayabe, Dongyoun Kwak:A study on the control of normal shock wave over an airfoil by aerodynamic device, 61st Aircraft Symposium, 2A05, Kitakyusyu-shi, Nov.2023.(in Japanese)

Ryohei Higashitani, Tomoaki Ikeda, Mitsuhiro Murayama, Kazuomi Yamamoto, Yousuke Ogino, Osamu Nozaki : Airfoil Trailing Edge Noise Prediction Using Synthetic Turbulence Sources for Linearized Euler Equations, The 63rd Conference on Aerospace Propulsion and Power/JSASS Northern Branch 2024 Annual Meeting and the 5th Symposium on Reusable Space Transportation Vehicles, Mar. 2024.(in Japanese)

Usage of JSS

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	64 - 1024
Elapsed Time per Case	10 Hour(s)

JSS3 Resources Used

Fraction of Usage in Total Resources[*1](%): 0.49

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	4,405,836.44	0.20
TOKI-ST	2,568,003.03	2.77
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	681.86	0.57
/data and /data2	80,649.00	0.50
/ssd	400.00	0.04

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	4.15	0.01

*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)	817.21	0.37

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