Drag reduction technology and high efficiency aircraft design technology

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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. JSS2 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 fundamental technologies that improve the environmental performances of subsonic aircraft such as low fuel consumption and low noise. In this year, tools and schemes for numerical analysis have been developed to study aerodynamic devices that prevent transition due to attachment-line contamination on a laminar-flow wing. Besides, the aerodynamic design of unconventional aircraft has been conducted. Specifically, numerical schemes have been prepared for the sensitivity analysis of double-bubble fuselage configurations to aerodynamic characteristics. In the aerodynamic design of a BWB aircraft, the cruise L/D of 25 has been obtained by the elliptic-lift arrangement of JAXA's low-drag airfoil.

Publications

N/A

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)

Resources Used(JSS2)

Fraction of Usage in Total Resources[*1](%): 0.69

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2](%)
SORA-MA	3,868,702.13	0.73
SORA-PP	27,696.91	0.22
SORA-LM	10,057.53	5.91
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2](%)
/home	664.44	0.61
/data	37,440.14	0.72
/ltmp	11,736.88	1.00

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2](%)
J-SPACE	51.55	1.71

[*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.

- **Resources Used(JSS3)**

Fraction of Usage in Total Resources[*1](%): 0.34

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	1,560,369.63	0.34
TOKI-RURI	10,146.26	0.06
TOKI-TRURI	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2](%)
/home	1,278.52	0.88
/data	63,283.18	1.06
/ssd	737.03	0.38

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2](%)
J-SPACE	51.55	1.71

[*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.